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Charles H. Parnes

President American Surgical Association

SURGERY, GYNECOLOGY AND OBSTETRICS

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NUMBER 1

THE X-RAY IN THE DIAGNOSIS OF GASTRIC ULCER AND ITS SEQUELÆ¹

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FOR the past eight years (1) European investigators have endeavored to increase the accuracy of gastro-intestinal diagnosis through the aid of the Röntgen ray. It is to be regretted that a method which gives promise of such an advance in methods of gastro-intestinal diagnosis, and which owes its inception to an American Canon of Boston (2) should have awakened in this country as yet so little interest as compared to that evinced by German and English clinicians and Röntgenologists. Little has been done in our country in the way of confirmation of work already done or toward familiarizing us with an already voluminous literature.

A number of unusual factors make the situation rather a difficult one. In the first place, the field is open to two classes of investigators of totally different training and attainments, both of whom are called upon to deal with an entirely unfamiliar subject, the Röntgenologist and the clinician not to speak of the surgeon proctologist, etc. The clinician is deficient in knowledge of X ray technique its possibilities and limitations, and lacks ability from lack of training to interpret either plate or fluoroscopic image. The Röntgenologist while enjoying an advantage in his knowledge of X ray technique

is at as great, perhaps a greater disadvantage. His lack of appreciation of the value of an anamnesis, of the methods of abdominal physical examination of alimentary physiology and of that difficult attitude which the gastroenterologist must maintain toward the question of functional disturbances make his position a difficult one and render him if he be so deficient from lack of clinical association almost dangerous in a considerable proportion of cases in which the X ray findings must be correlated with the clinical. The very cases in which the X ray examination is most needed and upon which the therapy often the question of operation depends. The only rational solution of the problem is a co-operation on the part of clinician and Röntgenologist in the utilization and development of the method. In this alone it seems to us lies the solution and attainment of valuable results.

The cases which form the basis of this paper are from the Medical Out-patient Department and Hospital of Washington University. The X ray work was done under the supervision of the Department of Surgery operative work from the same source. We wish especially to express our indebtedness to Drs. Dock, Murphy, Myer and Sachs for their assistance and encouragement.

¹From the Washington University Hospital. Read before the Saint Louis Medical Society, February 1913.

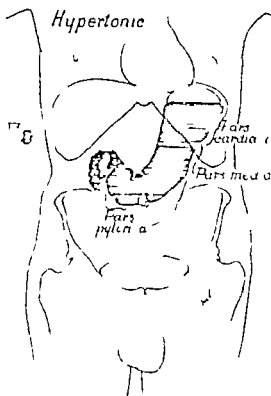


Fig. 1. Drawing from an individual case showing the hypertonic stomach as revealed in men of markedly atrophic habitus. Showing also the divisions of the stomach as used in X-ray work.

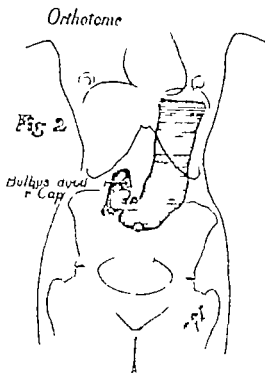


Fig. 2. Drawing from an individual case showing the orthotonic stomach occurring in men and women of normal atrophic habitus. Showing also the duodenal cap as formed by the contraction of the pyloric ring.

THE X-RAY ANATOMY AND PHYSIOLOGICAL CONSIDERATA

It will be in order to speak of the form and position of the stomach as revealed by the X-ray to appreciate certain changes that occur as the result of ulcer. The X-ray has given rise to a new anatomy—the anatomy of the living markedly different from that learned in the dissecting room or at the operating table. In our discussion, the stomach will always be described as seen while the patient is standing—the X-ray position. A prone or recumbent position alters conditions.

We have learned from the X-ray that the stomach during life is a pendulous elastic pouch (31) permanently supported at but

two points, the cardia and at the arch of the duodenum by the gastro-hepatic ligament, that it occupies in nearly all women and most men a far lower position and is more vertical as a whole than we had suspected (1-31) that it is never larger than its contents, be they solid or liquid and is not as a rule high in the abdomen in large part covered by the ribs as most textbooks and teachers of percussion would have us believe. We have come to appreciate that no organ or structure in the body is subject to such variations in form as is the stomach, not even the human face. There is no normal stomach—each individual possesses a stomach that fits his body. The living stomach as revealed by the X-ray is so different from our previous con-

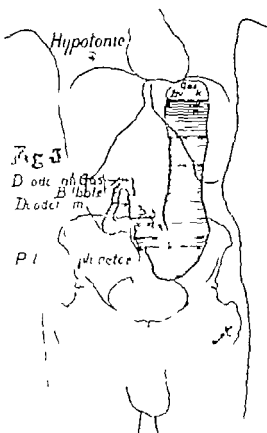


Fig. 3. Drawing from an individual case showing the hypotonic stomach occurring in those of women with asthenic habitus. Showing also the position of the duodenum, the trapped gas bubble at the arch of the duodenum, the peristaltic contractions of the pyloric sphincter and the antrum as bulbous or magnified.

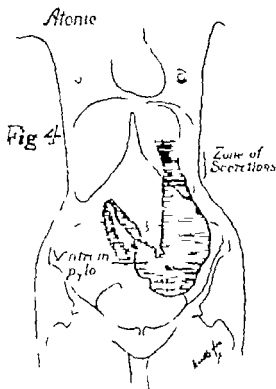


Fig. 4. Drawing from an individual case showing the atonic stomach seen in women of extreme asthenic habitus. Showing also the transitory antrum pylori and the aggregation of fluid content (secretions) and beneath bearing media.

ceptions that the use of an in part new nomenclature has become necessary for purposes of X-ray description. We therefore follow the classification of Schlegel (6) classifying stomachs as hypertonic, orthotonic, hypotonic and atonic. (Figs. 1, 2, 3 and 4). As seen this is a classification according to tonus. Tonus is a quality of contractility or resilience of living muscular tissue under normal conditions (7). It is the ability of the stomach (8). If powerful the gastric tonus molds the ingested food into a firm mass. If weak the food mass gravitates to the pendant position of the organ but little affected as to form by pressure of the gastric wall (9). In

other words in atony the food gives form to the stomach.

The type of stomach fits its owner. The hypertonic stomach accompanies powerful build and strength. The atonic occurring in those who are markedly so deficient or whose stomachs are the seat of pathological lesions causing atony. All intermediary forms occur. The form and position of the stomach then is dependent upon the habitus of the individual. In those of sthenic habitus, the hypertonic, the stomach is of the type of the orthotonic retort form is to be found. Figures 1, 2, 3 and 4 show different types of stomachs. Each drawing is an exact reproduction of a figure and stomach of an individual case. The stomachs

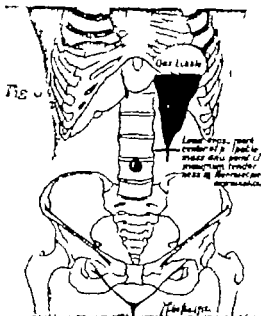


Fig. 5. Schematic drawing showing the delay in emaliation. The stomach is held up abnormally long in the pars cardiaca on account of localized ulcer evoked spasm of the circular muscular fibers at the ulcer level. The site is indicated by the cross, also show the coincidence of palpable ulcer mass, point of maximum tenderness where there is limitation of the parietal peritoneum and X-ray evidence at the same point. Compare Figs. 5 and 6.

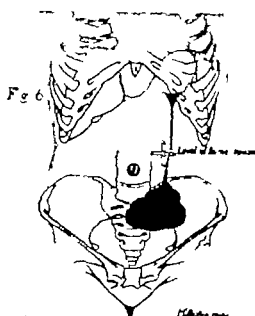


Fig. 6. Schematic drawing illustrating the sudden precipitation after suspension of the first few mouthfuls of the barium media on sudden relaxation of the localized spasm at the ulcer level. Also serves to show the canalization of an atonic stomach.

have been accurately corrected. In asthenia the so-called "congenital enteroptosis," the atonic drain trap or hypotonic fish hook form is present. (Figs. 3 and 4.) This relation of stomach to habitus is so constant that we may with confidence predict the type of stomach in a given case from the general physique. If it does not correspond there is at once raised a question as to its being normal (Fig. 7).

We have come for reasons of convenience to consider the stomach as visualized by the X-ray as divided into three portions, each representing approximately one third of that organ. These following Hiss (45) are called the pars cardiaca, pars media, and pars pylorica. (Fig. 1) The first two (pars media and cardiaca) constitute the vertical stomach, actually vertical in a majority of persons. The pars pylorica smaller than the former divisions, joins them at an angle (1) (Fig. 1) We have come to refer to the

pars pylorica as the horizontal stomach. There are in the X-ray shadow anatomical divisions for these zones that need not be here considered (5). As a peristaltic wave reaches the distal portion of the pars pylorica this is nearly though never completely (11-13) shut off into a separate chamber the antrum pylori. (Fig. 4.) The contraction of this through a continuation of the peristaltic wave presses the antral contents through or against the true pylorus. The distal boundary of the antrum pylori is the pyloric ring or sphincter (Fig. 3). Just beyond the antrum is to be seen transiently a small triangular shadow the cap (30) representing the first part of the duodenum or bulbous duodeni (25) (Fig. 3). The differentiation of cap from antrum is effected by closure of the pyloric sphincter and occurs only during such closure. The stomach as a whole is always capped at its cardiac end by a collection of gas, the magenblase of the Germans. (Fig. 3) This differs much as to size, which has little significance,

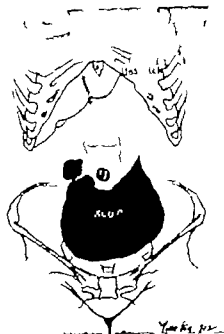


Fig. 7. Schematic drawing showing the arrangement of the bismuth meal in the extremely atonic stomach. In this instance also indicates the failure of visualization of an ulcer located on account of such atony the bismuth being below its level. Compare with Fig. 8.

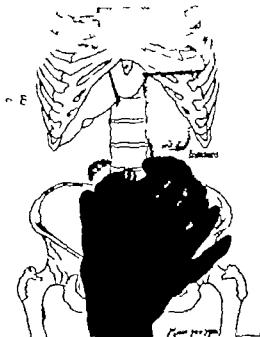


Fig. 8. Schematic drawing showing palpation with the gloved hand behind the fluoroscope. One object is to drive the bismuth media into the areas in which the bismuth has accumulated on account of atony. Compare Fig. 7.

and sometimes as to form which may have much (Fig. 22). A much smaller gas bubble is frequently to be noted as trapped in the arch of the duodenum (Fig. 3).

If the passage into the stomach of the first six or eight mouthfuls of a bismuth bearing meal is watched it will be seen when tonus is good, that this small amount is held up in the pars cardica in the form of an inverted pyramid for a few seconds and then slowly progresses to the lower portion of the organ (1) as in Fig. 5. This is the normal delay to gastric canalization seen in the stomach having good tonus. If more bismuth be ingested the normal stomach will distend both laterally and longitudinally especially the former to accommodate the addition (24) but will always hold up its contents in more or less of a column. (Figs. 1 and 2). An atonic stomach shows no tendency to arrange its contents in a columnar form, they seep downward unsupported to the lowest portions of the organ and there collect (7) (Figs. 6 and 7). An appreciation of this phenomenon is essential

in order to understand its variation that takes place in ulcer of certain locations.

The peristalsis of the stomach is a familiar phenomenon fluoroscopically it is indicated by a bulging on the greater curvature that begins normally in the pars media and slowly progresses without essential change in form until the pyloric sphincter is reached (12). It may be likened in its progression to an oncoming breaker or the widening ring formed by casting a pebble into the water. Peristaltic waves occur normally about every 20 seconds (8, 27) they may be excessive, normal, deficient, or absent as to strength and frequency in a given case.

At the expiration of from one and one half to six hours the normal stomach completely empties itself of the Rider bismuth meal (1). Gastric motility is controlled by the hydrochloric acid of the gastric juice and the alkalinity of the duodenal secretions (29) by peristalsis and by the form of the stomach. Peristalsis being chiefly dependent upon tonus (42) the form of the stomach being



Fig. 9. Flat showing incision of an ulcer crater and an extraordinarily deep incisura leading to the formation of typical functional hour-glass stomach. Retouched (the same plate is also shown in the next figure not retouched)

also due to the same cause plus the individual conformation and regional capacity of the abdominal cavity (colon pressure etc.) (40) It follows that the gastric motility is markedly influenced by the physique of the individual since the degree of tonus bears a direct relation to the habitus. Such is found to be the case. In those of asthenic habitus, individuals having hypertonic stomachs of high trans-abdominal position the stomach empties itself quickly in those of modified or asthenic type (enteroptotics) more slowly. In the latter the time of clearance may even exceed six hours.

THE X RAY EVIDENCE OF ULCER PROPER

Ulcer of the stomach results in different X ray findings, depending upon the portion of the stomach affected. Experience has shown that ulcer of the approximately vertical portions of the stomach, i. e. the pars cardica and pars media, give rise to similar pictures in contrast to those of the horizontal

portion of the organ the pars pylorica, and of which by the way unless obstructive our knowledge is much less exact. We have classified the evidence of gastric ulcer to be derived by X ray examination primarily into changes in tonus, changes in position and form, changes in peristalsis and motility and relations that restricted areas of pain tenderness and mass bear to X ray findings. These have been subordinated as shown by the general schema (pages 22 and 23)

I Changes in tonus resulting from gastric ulcer (A) When of the pars media or cardica the vertical portions of the stomach, it may be suspected by changes in tonus resulting in (a) incisura (b) delay in canalization, and (c) functional hour glass stomach.

(a) By an incisura we understand a sharp, narrow usually quite deep indentation of the stomach lateral border opposite that curvature on which the ulcer occurs, caused by sharply localized tonic spasm (34) of the circular muscular fibers of the stomach at the



Fig. 9. A double incisura caused by two ulcers at almost the same level in the pars media. On fluoroscopic examination typical delay in canalization was observed and the critical position characteristic of ulcer of the pars media. The somewhat oblique position here shown is due to strapping the abdomen with adhesive tape in order to drive the beam straight above the level of the incisura that the latter might be apparent on the plate.

level of an ulcer (18 15 16 19 17) (Figs 9 and 10). These spasmodic local muscular contractions are probably in some way evoked by special irritability of the ulcer. Each ulcer causes its incisura. Even when two ulcers are on almost the same level the resulting defects in outline may preserve their individuality even when all but superimposed (Fig. 10). In this instance, operation showed two small ulcers on nearly the same level on the lesser curvature and posterior wall causing a sort of double incisura—the only case of the kind we have ever seen reported. Incisurae may vary much in size though their form when evoked by ulcer or its sequelae is approximately the same. They are blunt or finger-like indentations, their depth greatly exceeding their width in contour sharp and regular. They may be so deep and commensurably

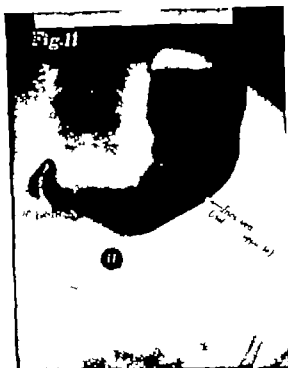


Fig. 11. Plate showing the incisura opposite an adhesion on the posterior surface of the stomach also point of maximum pressure sensitiveness that falls within the gastric shadow yet the ulcer being in distant locality Retroached.

wide as to nearly divide the stomach (Fig. 9) or not more than a centimeter (35) (Fig. 11) or even a few millimeters deep as shown in Fig. 11 the shallowest incisura we have seen reported. Almost invariably incisurae occur on the greater curvature (4) as gastric ulcers are of course situated in the very great majority of cases on or near the lesser curvature. We have long been accustomed to associate the site of gastric ulcer with a certain saddle shaped area of limited extent on the lesser curvature and lateral walls of the stomach just before the pylorus. The X-ray examination will result in apparent, perhaps actual, extension of this area. Owing to the relaxation and lengthening occurring in all but hypertonic stomachs, this ulcer bearing area probably occupies in part the lower vertical lesser curvature consequently incisurae will be seen more frequently in the middle zone of the stomach than we would expect from their

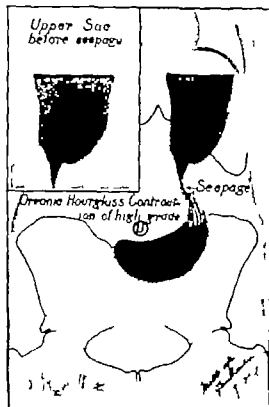


Fig. 1. Schematic drawing after Faulhaber of findings in organic hour-glass stomach of high grade. Note the central position of the connecting isthmus. The corner drawing illustrates the upper sac before the filling of the lower, which takes place slowly. Compare with the functional hour-glass stomach, Figs. 9 and 9, and of lesser organic contracture, Figs. 7, 9, and 5.

situation as determined at operation and post mortem. Incisure caused by ulcer result in a partial transverse division of the stomach (Figs. 9 and 10.) When such bloculation exists as the result of ulcer the isthmus connecting the two divisions of the stomach thus formed will be eccentric with regard to the gastric longitudinal axis (16) In contrast distinction to the condition obtaining in organic hour-glass stomach (4) (Fig. 12) and that resulting from carcinomatous ulceration (36) Emphasis was laid on the qualities of narrowness and sharpness of outline of ulcer incisura as viewed fluoroscopically because other conditions lead to the formation of fill-



Fig. 2. Plate showing pseudo-incisura that might be easily mistaken for carcinoma. Such filling defects are in most instances due to pressure of the rib margin, feces or gas in the colon. At times they are irreducible. Very slightly retouched.

ing defects somewhat similar and it is of the utmost importance to properly interpret these atypical findings. Thus carcinomatous ulceration unless on the basis of an old ulcer may cause a broader more irregular less markedly finger-shaped indentation than does benign ulcer. A localized accumulation of gas—or more dangerously an unvisualized extragastric tumor or feces in the descending colon—may through pressure result in a spurious indentation. The pressure of the lower ribs where they cross the stomach frequently causes a pseudo-incisura (17) The plate giving greater reinforcement of detail is particularly instructive in clearing up such conditions, also as we have practiced is deep respiration on the part of the patient during fluoroscopic examination, causing the artefact to move with the diaphragmatically attached descending colon. Artefacts of such kind usually give other indications of their spurious

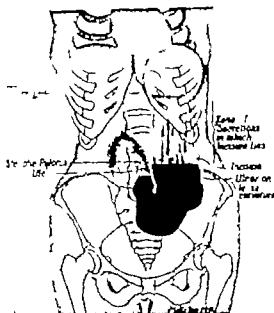


Fig. 4. Schematic drawing showing the position of the ulcers referred to in the legend of Fig. 5. The drawing illustrates the critical position of the stomach typical of ulcer, here occurring in the pars media and cardica. A large zone of residual secretions is present. Within this zone of secretions an incisure occurs due to an ulcer on the lesser curvature opposite. The incisure being above the level of the bismuth media indicates the necessity of palpation for its localization. See Fig. 6.

nature. They are of more obtuse angulation (Fig. 13) they lack permanence of location and form above all, they do not survive vigorous palpation. More difficult to interpret is the incisura caused by an ulcer scar or perigastric adhesions (34). The incisura of ulcer scar seems as a rule more shallow than that of ulcer (35). Fig. 11 illustrates a shallow incisura due to a localized adhesion probably at the site of an old ulcer. All apparent incisures should be supported by an ulcer anamnesis, as is true of all X-ray evidence of ulcer (7) without, they must be overpoweringly suggestive to gain serious consideration.

Incisures may fail to appear fluoroscopically on account of insufficient intragastric pressure to stimulate them, or because the bismuth mixture is below the level of the ulcer



Fig. 5. Flat showing dilatation with compensatory hypertrophy due to prior ulcer cicatrization. The stomach is very large (true megalogastrium), yet lacking the central position of the non-compensating stomach. A bismuth due to second ulcer on the lesser curvature opposite may be seen within the zone of secretion above the level of the bismuth media. For further details see Fig. 4. Not retouched.

and its resulting incisura, and so is not visualized. (Fig. 7.) This difficulty may be overcome by forcing the bismuth mixture by manual palpatory pressure upon the patient's abdomen while behind the screen into that zone of the stomach in which the ulcer lies. (Fig. 8.) Such a condition is usually due to an associated atony of the stomach. (Figs. 6 and 7.) Another cause of the bismuth being below the level of the ulcer incisura is that the stomach may contain fluid even though in a fasting condition either in the form of a residuum in cases of motor insufficiency or its own excessive fluid secretion in some cases of hyperchlorhydria. Such fluid being lighter than the bismuth incorporated media occupies the upper zones of the stomach (3) which containing little or no bismuth are invisible or nearly so. If now the incisura occurs within this area it will not be

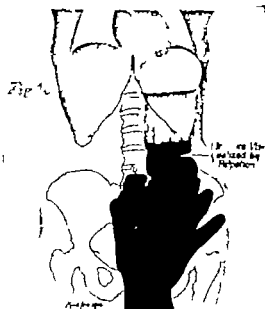


Fig. 16. Schematic drawing: the fluoroscopic palpation which serves to visualize an incisure, here the bismuth media is below its level on account of residual fluid in the stomach. Compare Figs. 14 and 5.



Fig. 7. Fluoroscopic image showing decidedly probable organic hour-glass contracture (slight) in the pars pylorica or very low pars media (unconfirmed). The contracture is in part functional. Classical ulcer symptoms including hemoemesis. Retouched.

apparent fluoroscopically and be seen with difficulty on the plate. (Figs. 14 and 15.) This difficulty is also to be overcome by making palpatory pressure upon the patient's abdomen behind the screen thus forcing the lower bismuth containing substance into the upper fluid containing but bismuth deficient zones. (Fig. 16.)

Incisurae have been described as occurring ideopathically (18-16). The possibility of overlooking an ulcer erosion or scar at operation must be considered, especially if as in this instance must be the case, no resection be done and the gastric interior be not inspected palpation and inspection alone being relied upon for ulcer detection. Much has been written by German authors concerning intermittent local ulcer contractions, as indicated by transitory incisurae, which are held in general to indicate simple ulcer or erosion (18-16) in contradistinction to the more permanent incisura resulting from callous or florid ulcer (9). The view seems correct certainly permanence adds to

the probability of an incisura resulting from an active ulcerative process. Personally we are inclined to regard the occurrence of a typical ulcer incisura with ever-growing respect. We have never seen one in any but a case giving an ulcer history nor had it fall when subjected to trial by operation, though it is true our experience has been limited. In two cases it indicated the existence and position of a second ulcer and in one of scar (probably the site of a former ulcer) where their presence was unsuspected and would have been overlooked but for the X-ray evidence. Ulcer of the vertical stomach, however may occur without an incisura.

There are two other changes of gastric tonus that are considered indicative of ulcer of the pars cardica and media delay in canalization and functional hour-glass stomach, both resulting like incisurae from localized spasm of the gastric muscular fibers at the ulcer level.



Fig. 8.

(b) By a delay in canalization we understand a marked pause in the descent of the first few mouthfuls of the bismuth media as it progresses from the cardia to the lower part of the stomach (19 5 7) (Figs. 5 and 6). The first mouthful may not be delayed (4) suggesting that the local spasm is not extant in the empty stomach (9). Such delay must be due to similar localized spasm of the circular muscular fibers of the stomach a condition that we know from our studies of incisure does occur as the result of ulcer of the pars cardiaca and media. The observation of delay in canalization is purely a method of the fluoroscope. It is our custom to instruct the patient to take eight swallows (about 60 cc.) and then cease until the arrangement of such amount in the stomach is noted. In estimating the genuineness and significance of a delay in canalization

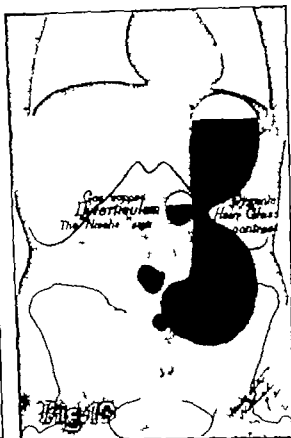


Fig. 9. Schematic drawing after Hauke illustrating X-ray findings associated with penetrating ulcer that has excavated cavity in neighboring organ, the Nissen sign. The excavation is represented by the adventitious gas-capped shadow on the lower curvature. Also shows slight organic hour glass contracture at the same level which accompanies penetrating ulcer in the majority of cases.

there are a number of factors that are most important to bear in mind above all, the influence which the type of stomach and the tonus that may be expected from such consideration has in each individual case. For example, in an individual of sthenic habitus with broad intercostal arch (Fig. 1) we may anticipate with confidence an hypertonic steer horned stomach of a normally high degree of tonus. (Fig. 11.) In such a stomach the first few mouthfuls of the bismuth media will be normally held up for a number of seconds in the pars cardiaca, and such an occurrence is not suggestive. On the other hand, in asthenia we expect an atonic stomach.

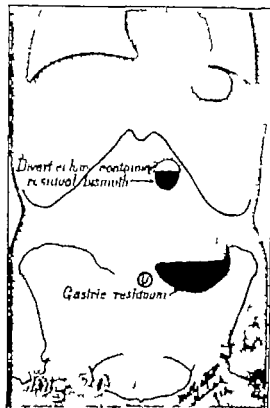


Fig. 30 After Haeckel. Showing how penetration (incavation) ulcer diverticulum may retain bismuth after the contiguous part of the stomach is empty. Compare with Figs. 9 and 10.

(Fig. 4.) Here the same delay in canalization would have significance because we should expect immediate precipitation of the bismuth on account of deficient tonus. Again, the greatest care must be taken to prove that an apparent pause in canalization is not caused by extraneous factors: pressure by organs, tumors, gas or feces filled intestinal loops, etc. The ulcer filling pause usually endures but a few seconds though it may last several moments, in the case depicted about one and one half. It is said to last at times much longer. A criterion as to the genuineness of a filling pause that knows no exception is that after suspension of a suggestive nature the descent to the lower portion of the stomach must be sudden (7 5 4) (Figs. 5 and 6.) This is one of the chief dif-



Fig. 31 Plate showing pseudo-Nuchez sign due to collection of bismuth trapped between duodenal contractions (adhesions) secondary to pericholecystitis. The case illustrates the necessity of numerous examinations such as this instance cleared up the condition. The shadow of large number of loops in the gall-bladder is apparent on nuchez and point between the apparent diverticulum and the . . . It is doubtful if it will appear in the reproduction. Slightly retouched.

ferential points between the suspension due to local spasm and that resulting from organic obstruction. The sudden precipitation is of course suggestive of relaxation of the ulcer evoked spasm. A delay in canalization seems to occur only in cases where a permanent inclosure is present.

(c) A functional hour-glass stomach we consider as one which exhibits in its filled form a permanent deformity of the nature of an inclosure of such depth as to apparently divide the stomach into two compartments connected by an asymmetrically placed isthmus (6 19) (Figs. 9 and 10.) It seems to us inadvisable to refer to all permanent inclosure as resulting in the formation of functional hour-glass stomach regardless of their depth. To be classified a functional hour-glass

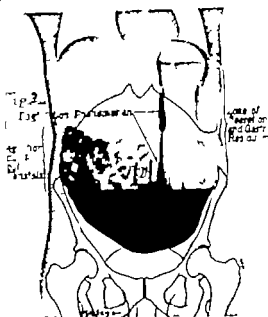


Fig. 2. Schematic drawing showing the enormous size, globular form and especially the increase in the right median distance typical of high grade obstruction early of ulcer origin. The presence of residual food (secretion or ingesta) and the deglutition phenomena (the passage of air allowed through such areas) are also shown. 'T' the right is indicated the unavailing antral peristalsis. Compare Figs. 3 and 24.

stomach there should be an apparent bioculation of the stomach, this division amounting to at least one half the gastric diameter at its level. Associated with functional hour-glass stomach a delay in canalization may occur followed by sudden discharge of the sustained contents into the lower portion of the stomach. Functional hour-glass stomach is an associate of callous and florid ulcer and apparently only occurs in the pars cardica and media especially in the latter as is true of incisurae. We have had two unconfirmed cases that seem to show incisurae in the pars pylorica, one resulting in hour-glass-like contraction in part at least functional (Fig 17) they are exceptional. Both gave typical ulcer histories, including haematemesis neither showed X ray evidence of ulcer else



Fig. 3. Plate showing ectasia due to pyloric obstruction from ulcer canalization of low grade though uncompensated. Note the increase in the right median distance also the formation of duodenal cup which does not seem to occur in more marked obstruction. Not retouched.

where. We show one but have no conclusions to offer. Care must be taken not to interpret a phase of antral peristalsis as an incisura resulting in hour-glass contraction. On the plate this is frequently seen to resemble the true incisura of the vertical stomach. The fluoroscopic examination only is of worth in such instances.

(B) Of changes in tonus resulting from ulcer of the pars pylorica nothing is known as yet.

II *Changes in position and form of the stomach due to ulcer.* Knowledge of what we might call X ray anatomy is an absolute essential to an appreciation of the changes in the position and form of the stomach resulting from ulcer. One should be thoroughly cognizant of the types of stomach to be expected in individuals of different habit, of the X ray pictures of hypertonus, atony and ptosis, of the relation which the different parts of the stomach and duodenum



Fig. 24. Fluor. showing the esophageal position and half moon formed transverse of the stomach in the lower pole of the extremely distal stomach of high grade pyloric ulcer obstruction. The extension of the shadow in the right median distance is very slightly retracted.

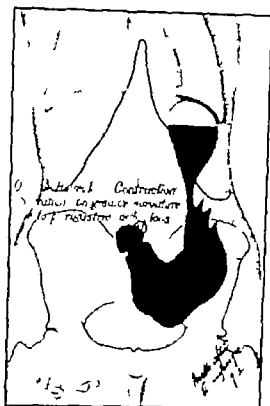


Fig. 25



Fig. 26

bear in different types of stomach of the variations which the stomach may suffer from outside pressure factors and during the different stages of the gastric peristole.

Changes in position and form due to ulcer may occur as the result of (A) conditions arising within the stomach such as dilatation from pyloric obstruction or focalization of the ulcer crater and from (B) causes originating without the stomach directly due to gastric ulcer such as perigastric adhesions or attachment on mass of the stomach to other organs as the result of such.

(1) Changes in the position of the stomach, the seat of ulcer in its vertical portions from causes within the stomach. The stomach with an ulcer in the vertical portion is as a rule one occupying the left median half of the body (15). It is essentially vertical in so far as its upper zone is concerned, parts

Fig 29



Fig. 28. Plate showing the left-sided position of a gastric remnant some time after the ingestion of the bismuth meal, when the ulcer is located in the vertical portion of the stomach. Very slightly retouched.

media and cardiaca. (Fig 9)¹ An exception seems to occur in cases of functional hour-glass stomach of high grade i. e. in which the incisura is of great depth and especially if located in the lower para media. In such instances the lower sac may extend to the right and be of such form as to suggest a miniature dilatation. (Fig 9.) It is possible that the local spasm results in enough of a stricture to add to the intragastric pressure of the lower ventricle when it is in peristalsis and so lead to its slight dilatation. The diagonal position (Fig 1) is apparently not seen where ulcer of the two upper zones of the stomach is present, nor is the form of the stomach as a rule identical with that seen in asthenics in that it does not present the characteristic pouchlike outline of the "ptosed" stomach (Fig 4). It seems possible that



Fig 29. A plate showing how far a markedly localized pressure sensitive spot may be from an ulcer. Also dilatation of the bulbous duodenum, believed from insufficiency of the pyloric sphincter when involved by an ulcer. Retouched.

this vertical left-sided position may be due to an acquired atony secondary to hyperacidity which as a rule accompanies ulcer, the atony being an expression of muscular fatigue caused by the physiological pylorospasm which occurs in cases of superacidity.

In addition to and associated with the vertical position of the stomach occurring in cases of ulcer of the vertical lesser curvature another very interesting condition has been noted in many cases that is that the position of the bulbous duodenum is also frequently changed, being further to the left and often higher than is normal (10-15) (Fig. 14). This malposition of the first portion of the duodenum and pylorus, if extreme gives rise to the "small form stomach" of German writers. (Fig 18.) Perhaps crook form would be more intelligible to us, the stomach being apparently sharply bent on itself at the junction of vertical and pyloric portions

¹ In Fig. 29 the position of the stomach, obtained by stamping the duodenum with a bismuth meal, is shown. In order to drive the bismuth meal above the ulcer level of that, the stomach might appear in the plate, represented as a result of extreme atony.

Fig. 50

F



Fig. 50. A drawing (from combined X-ray and operative findings of given case (see Fig. 49) at emptying shows the functional hour-glass stomach as it must exist in life but as it is seen at operation or post-mortem. The drawing also indicates perigastritis found about the ulcer site and adhesions from it to the abdominal wall producing parietal perforation irritation. In this case the X-ray evidence of ulcer (lacuna) corresponded to definite pericardial results.

This left-sided position of stomach and cap is graphically shown in the position of the gastric remnant several hours after the administration of the bismuth meal which is distinctly to the left. (Fig 28) It is by no means to be inferred that this crook form stomach with pylorus to the left is to be found in all cases of vertical lesser curvature ulcer still if present it is of diagnostic worth. If not, it only relatively militates against a positive diagnosis. No entirely satisfactory explanation has been offered of the phenomenon so far as we can learn. Authors speak of it being due to "longitudinal shrinkage" (4, 38) as a "drawing in of the lesser curvature" (22) by others as being due to adhesions, etc. (10) doubtless true in high grade conditions. It is hardly necessary to say that a left-sided dislocation of the stomach and pylorus may be caused by other conditions than ulcer, as from pressure of an enlarged liver. Carcinoma strictly localized in the pyloric portion of the stomach gives, as Haudek has pointed out (15) a somewhat similar picture especially if there be obliteration of the pars pylorica.

Of changes in form arising from causes within the stomach and resulting from ulcer of its vertical portion three most interesting pathognomonic signs have been described within the past two years. The crook-shape, left, laterally-displaced stomach and pylorus were just discussed under changes in position and is not included. The three referred to are the visualization of the ulcer crater—a phenomenon associated with penetrating ulcer the so-called "Nischen symptom" (22) and the X-ray manifestation of organic hour glass stomach. With one exception they are all evidences of ulcer of the vertical portions of the stomach pars cardiaca and media the Nischen symptom of penetrating ulcer being found uncommonly in ulcer of the pars pylorica (16, 28).

The outline of the bismuth-containing stomach represents but the projection on plate or screen of its maximal lateral diameter. A hand held between a light and the wall casts a shadow representing the contour of the obstructing mass in the same manner. If now there be any sharply localized periph-

eral addition to this obstructing mass it must of necessity show as a projection on the margin of the shadow. An ulcer crater may thus become visualized through virtue of the bismuth it contains (19, 4, 22) provided the ulcer be situated on the periphery as the stomach is viewed from the front, or it be possible to turn the patient so that a tangential view (17) may silhouette the outline of the crater. Fig 9 shows such a crater visualization. The position of the crater is suggested by the presence of the extraordinarily deep incisura leading to the formation of a characteristic functional hour-glass stomach. The crater in this instance is especially finely shown on account of an accidental accumulation of intestinal gas behind it. A tiny gas bubble is to be seen caught in its upper zone a phenomenon also observed by Haudek (35). Such a crater need be no more than a few millimeters deep to be recognized (35, 4). An apparent crater phenomenon must be subjected to the closest scrutiny not only as to the character of the projection but especially as to form and site at subsequent examinations.

Of the two other positive X ray indications of ulcer of pars cardiaca and media mentioned, i. e. those associated with penetrating ulcer and organic hour glass stomach, we can show no plates as we have never had the good fortune to examine cases which have been confirmed. They are both quite rare but are thoroughly well established and proven ulcer indications. For the sake of completeness they are reviewed from the work of others. Haudek (14) Faulhaber (19, 4) and Reiche (20, 23). If an ulcer gradually penetrate the gastric wall may at such site become protectively adherent to a neighboring organ or structure thus exposing unprotected tissue to the action of the gastric digestants. As a result a pocket may be excavated in the adherent organ. Such penetrating ulcers are occasionally found at autopsy (39). Haudek (15) has especially emphasized the following X ray findings associated with the condition. When filled with bismuth the X ray will show such a diverticulum as a small circular shadow without the main intragastric mass and connected to it by a narrow isthmus of varying

length. A gas bubble is as a rule trapped in the upper zone of such a pocket. (Fig. 19) After the stomach is empty such a pocket usually still contains bismuth (Fig. 20.) During fluoroscopic palpation the bismuth in the adventitious cavity cannot be affected by manipulation though it usually can be stripped from the contiguous portion of the stomach. The length of the isthmus connecting the pocket with the stomach may be only the thickness of the gastric wall or several centimeters in length in which instance it represents a sinus burrowing through resistant scar tissue. The liver is most commonly the seat of penetrating ulcer (16) the pancreas probably next in frequency (14). Difficulty may be experienced in differentiating such diverticula from duodenal bismuth masses, also often capped by a small gas bubble. To illustrate how confusing such a duodenal remnant may be we may cite the case of an individual whose history might be interpreted as indicating chronic ulcer. In plates taken at the first X-ray examination a perfect penetration diverticulum was apparently to be seen surmounting the pars pylorica suggestive in size circular surmounted by a gas bubble and even showing sedimentation of the contained bismuth mixture indicating some permanence. (Fig. 21.) Certain features on other examination lack of uniformity as to size and shape and absence of respiratory excursion in common with the liver indicated its being a pseudo-Nissen symptom and such it proved to be. At operation no evidences of a penetrating ulcer were found heavy duodenal adhesions at two points accounted for the fact that bismuth was caught in the duodenum between them. In the differential diagnosis of duodenal mass and true Nissen sign the rule is to identify both the duodenal gas bubble and that of the diverticulum (5).

There remains to be considered those changes in form, manifested by the X-ray occurring in organic hour-glass stomach. Organic hour-glass stomach so far as we have been able to learn has never been proven as a result of ulcer of the pars pylorica, though conceivable as a result of ulcer there situated. (Fig. 17.)

Organic hour-glass stomach implies a more or less median constriction of the stomach as a result of the contractures of callous ulcer and associated processes. The X-ray picture resulting might be imagined as that of two small atypical gastric ventricles connected by an isthmus. While this is true late in the examination and in slight contractures it is not immediately the case where the condition is marked. Usually the X-ray manifestation on immediate fluoroscopic examination or in plates taken shortly after the administration of the bismuth mixture is that of a single bismuth mass situated high in the abdomen the proximal sac atypical in its lower contour showing no tendency to turn toward the right (7) (Fig. 12, corner drawing).

Other conditions are conceivable as capable of causing simulating phenomena. We have had a case of involvement of the median stomach by syphilitic gumma operatively confirmed that gives a typical hour-glass retention in the upper sac. Fig. 17 probably shows a slight organic contraction. In organic hour-glass stomach of ulcer origin, a lower bismuth mass will later be seen to form slowly representing the lower sac. A characteristic of organic hour-glass stomach of high grade is that this filling of the lower sac takes place slowly by seepage (19, 7). (Fig. 12.)

(6) Of changes in (1) position and form due to intragastric causes when non-obstructing ulcer of the pars pylorica is present, nothing is definitely known. In common with non-obstructive ulcer of other locations the stomach shows a degree of atony often unexpected from a consideration of the patient's habits. (Figs. 6 and 7.) This atony probably is caused by retention due to pylorospasm in turn secondary to hypersecretion or hyperacidity. Rarely a penetrating ulcer gives rise to a Nissen sign the diverticulum above the pars pylorica and within the B. or (16, 29).

(2) If the pyloric lumen is markedly obstructed by callous ulcer or cicatrix, characteristic changes occur if there be no compensatory hypertrophy of the gastric walls, namely a central position, an increase in the lower transverse diameters of the stomach and

especially extension to the right of the median line (37 16) (Figs. 22 and 23) This median position of the ectatic stomach is graphically shown in the position and form of the gastric residue, median in position and crescentic in outline (15 4) (Fig. 24.) In extremes the form and position of the stomach is only limited by the walls of the abdominal cavity (Fig. 22) In extreme uncompensated pyloric obstruction from ulcer cicatrization enough bismuth may not escape from the stomach at a time to form a duodenal cap though this is not true of the lesser grades. (Fig. 23) In certain cases even in compensated obstruction instead of the sharp transverse terminal shadow caused by the contracted sphincter we may have a conical distal termination of the shadow of the pars pylorica representing the narrowing lumen. (Figs. 14 and 15) The normal condition is shown in Figs. 1 2 and 3 (3) In case there be an adequate compensatory hypertrophy following ulcer obstruction, the stomach certainly in some instances resumes approximately its normal form and proportions though still dilated as shown in Fig. 15 In this case as indicated by the drawing two ulcers were present, one in the pars media, the other obstructing the pylorus. (Fig. 14.) The stomach compensated fairly well, as shown by a small residuum after six hours. (Fig. 18) Its form and position is that of an unobstructed though very large stomach, a true megalostrum, dilated but compensatorily hypertrophied. At operation the gastric walls were found about three times as thick as normal. An interesting feature of obstructive ectasy that may often be observed fluoroscopically is that the presence of fluid in such a stomach, either retained secretions (Fig. 14) or residual ingesta, can be detected before or during the ingestion of the bismuth media. Before, by the half moon shape of the gas bubble whose lower border represents the surface of the residual fluid later by the fact that the separate swallows of bismuth drop to the lower portions of the stomach in isolated blobs like tar through water (7) — the deglutition phenomenon (Fig. 22)

(B) Changes in form from extragastric

conditions resulting from ulcer are hardly separable from changes in position nor can we classify according to which portion of the stomach is involved Perigastric adhesions most generally modify the position and form of the stomach in common In some instances, however (a) localized changes in outline have been described without essential change in position by Clairmont and Haudek (28) and Arnsperger (5) In their cases perigastric adhesions resulted in local serration of the gastric border in both instances the greater curvature (Fig. 25)

(b) Changes in position as a whole arising from processes without the stomach due to ulcer are limited to the results of ulcer perigastritis, and consist of those malpositions resulting from extensive adhesion of the stomach to neighboring structures. The most common attachment seems to be that of the stomach to the under surface of the liver (16) Fig. 26 possibly shows such a condition though unconfirmed The patient gave a classical ulcer anamnesis A discrepancy between the high position of the stomach so adherent and the habitus of the individual may be suggestive.

Most careful scrutiny is necessary before reaching such conclusion to eliminate the possibility of malposition arising from extragastric pressure factors especially a distended colon.

III. *Changes in peristalsis and its resultant motility or clearance* When X ray studies of the human stomach were first made, the peristalsis as a very apparent phenomenon became at once the object of investigation with the hope of its being utilized for diagnostic ends. Less has resulted from such efforts than in the case of any other of the gastric phenomena. There are few inferences that we can as yet draw from its variations such as there are, are chiefly connected with obstructing ulcer of the pylorus. The same to a considerable degree is true of motility though certain of its variations are decidedly helpful

(A) Changes in peristalsis and motility without pyloric obstruction It has been proven by Pavlov and his school that the cause of closure of the pyloric sphincter is the

presence of hydrochloric acid in the first portion of the duodenum and that this remains closed until this duodenal acid content is neutralized by the pancreatic, hepatic and intestinal secretions (29). So we should expect in hyperacidity or hypersecretion, which usually accompany ulcer delay in motility as a result of prolonged sphincter contraction at the same time increased peristalsis on account of the pyloric obstruction thus offered.

As far as the motility is concerned it is true that a gastric residuum after six hours without other adequate cause adds to the probability of ulcer being present (44, 33) in the case of hyperperistalsis less apparent. A discussion of why this is true would at present lead us too far afield. About all we can say is that when we see an exaggerated peristalsis it somewhat adds to the probability of ulcer being present delayed clearance decidedly more so.

Antiperistalsis, a peristalsis in which the waves progress toward the cardia, has been described as an uncommon manifestation of non-obstructing ulcer of the pars pylorica by Haudek (32) and more frequently met with in pyloric obstruction. It is not common. In the cases observed by us, peristalsis has always originated at or below the ulcer level if indicated by an incision even where this is quite low in the vertical stomach.

So far as ulcer is concerned delayed motility indicates either an organic pyloric obstruction or delayed clearance from non-compensated hyperacidity or hypersecretion i. e. relatively inadequate alkalinizing secretions. As to whether a delayed motility is due to organic or functional obstruction the clinical findings and the degree of retention must indicate. However from an X ray standpoint, the fact that the stomach does or does not extend suggestively far to the right of the median line (Fig. 23) may speak for or against an organic obstruction though in the milder grades of organic stenosis or where compensated we may not have a right median increase (Fig. 14). We have already called attention to the fact that certain *aethenics* show a delayed motility on a six

hour test, which should be borne in mind in reaching a conclusion. Again, some cases of organic pyloric obstruction do not even show a delayed clearance on a six-hour X ray test (compensatory hypertrophy). If a non-obstructive ulcer involve the pyloric ring we are strongly under the impression that it may result in its incomplete closure (insufficiency), at least until the onset of the acid evoked pylorospasm. This implies a belief in a mild tonic closure of the pylorus (43) at least when food enters the stomach (13). In the case from which Fig. 29 was taken the duodenal cap filled with every gastric peristole and the first part of the gastric clearance was exceedingly quick after a time this ceased and at the end of six hours the stomach contained a small residue (true pylorospasm). The plate shows the cap dilated its under lip pouching, the only one of seven to do so. Operation disclosed a small ulcer directly in the pyloric ring with the first portion of the duodenum markedly dilated. (It is possible that the over prompt and illogical [hyperacidity present] initial clearance in duodenal ulcer may be due to the same cause.)

(B) Ulcer of the pyloric portion of the stomach if resulting in obstruction may manifest itself by most marked hyperperistalsis at some time during gastric digestion, beginning high in the stomach and characterized by increased size in the peristaltic bulgings and the fact that two or three such peristaltic waves may be in progress at the same time. This hyperperistalsis is often not observable until some time after the ingestion of the bismuth media. Such peristalsis represents the effort of the stomach to overcome the pyloric obstruction. One of our cases (Fig. 22) illustrates well a type of peristalsis occurring at times in pyloric obstruction, a peristalsis limited to the extreme pyloric portion (5). It was indicated not only by the changes in form of the pyloric gastric wall but by the sharply limited commotion in the bismuth media at such locality as seen fluoroscopically. Antiperistalsis originally described by Jonas (26) is said to occur much more frequently in cases of pyloric ring obstruction than where the ulcer is in the pars pylorica yet non-obstructing still it is far from common.

If ulcer of the pylorus or its cicatrix be so situated as to cause organic obstruction most amazing changes in the gastric clearance occur as shown by examination at intervals of an hour or two after ingestion until the gastric contents have passed through the pylorus or are vomited. An ectatic stomach may retain a considerable amount of bismuth for many hours—8 to 24 or longer. A plate taken six hours after the bismuth ingestion will graphically show the amount of retention the retained bismuth occupying a median position (Fig. 24.) In this connection we may again interpolate the caution which if not observed will lead to disastrous results, that some asthenics (enteroptotics) show a bismuth remnant after six hours a type of individual who may present clinical symptoms suggestive of a slight pyloric stenosis, in reality of functional origin and so further endanger the diagnosis.

We must thoroughly grasp the fact that the gastric clearance is to be anticipated by the physique of the individual. A point of differential diagnostic value as between organic obstruction and delay in clearance due to anomalies of tonus and form is that without organic obstruction the stomach will empty itself much more quickly when the patient lies upon the right side. If the obstruction be organic, posture has no effect on the time of clearance (41).

THE RELATION OF POINTS OF PAIN, TENDERNESS AND LOCAL MASS TO X RAY FINDINGS

The X ray will be a potent factor in deciding certain questions as to the relation that localized visceral lesions bear to points of pain and tenderness. The stomach and duodenum being readily identified and comparatively immobile are peculiarly suited for such studies. Pressure-sensitive points and localized voluntary pain can scarcely fail to be of diagnostic import either positively or negatively if deductions from such observations are controlled by lessons to be learned from special investigations that are available. Without such control, deductions will surely be most misleading and dangerous.

Ulcer of the stomach may exist and in conjunction with it a localized pressure-sensitive point. If such a spot be present it may fall entirely without the X ray shadow of the stomach and at the same time no other cause than ulcer be present to account for its existence (Fig. 29.) A definitely localized pressure point may exist that falls within the gastric shadow yet operation reveal an ulcer in a distant locality (Fig. 11.) The tender point may coincide with the site of an ulcer as determined by the plate or screen, and subsequently at operation ulcer be found in a corresponding situation.

Yet we know while this is true when the stomach is perhaps moderately full, it cannot be the case when it is empty and collapsed or when overdistended yet the painful locus is always the same. It is the explanation of such everyday findings that we must attempt before essaying their utilization for diagnostic ends.

Certain physiological teachings will aid us in understanding the relation that pain and points of tenderness bear to gastric ulcer. The pain and tenderness due to gastric ulcer may originate from any or all of three causes. First, (a) the general unlocalized pain occurring at definite times after meals is due to intragastric hypertension plus special irritability of the ulcer (46). This is the only type of pain that a hollow viscus like the stomach can experience (50). An uncomplicated ulcer is not intrinsically painful or sensitive, as an ulcer on one's finger is (49). Such pain due to hypertension is worthless as an X ray diagnostic possibility because unlocalized. Second, (b) gastric ulcer may cause a localized area of pain or pressure sensitivity as the result of a reflex (47, 48). The exposed afferent nerve endings in the ulcer floor are irritated. These nerves transmit impulses to the cord by way of the posterior roots such pass out by way of the anterior roots. Head and Holmes recent work (53) has shown that the localization of pain is centered in the basal ganglia, hence we may say that the brain determines the definite locus of tenderness in the abdominal wall. This area need not be, and usually is not, directly over the ulcer. The occurrence of an area of

General scheme of article. The figures and letters marking the various headings and subdivisions correspond to those in the text.

I FROM CLINICAL

Necessity for co-operation of clinician and Roentgenologist

The X-ray gastric anatomy and physiological disorders. Form, types, variations, tones, peristalsis, motility

X-ray evidence of gastric ulcer proper

Changes in tones

I

(A)
Due to ulcer of the vertical portion of the stomach (pars cardialis and media)

(B)
Due to ulcer of the horizontal portion of the stomach (pars pylorica)

Changes in position and form (knowledge of X-ray anatomy essential)

II

(A)
Changes in position and form due to intra-gastric causes resulting from ulcer

(B)
Changes in position and form due to extra-gastric causes resulting from ulcer

Changes in peristalsis and motility (general and physiological observations)

III

(A)
Non-obstructing ulcer

(B)
In uncompensated pyloric obstruction from ulcer obstruction

Relation restricted areas of pain, tenderness and mass bear to X-ray findings (observations on peristalsis) Stomach suited such studies Necessary for care in deductions Possibilities as relation of pressure-sensitive lead to stomach shadow

IV

(A)
Causes of ulcer pain

(B)
Ulcer pain.

Incubation	()	<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting 	<ol style="list-style-type: none"> 6. Pseudo-incubation 7. Criteria of genuineness 8. Cause of non-appearance 9. Idiopathic incubation 10. Diagnostic value of incubation
Delay in canalization	(b)	<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Technique of observation 	4. Criteria of genuineness (influence of habits)
Functional hour-glass stomach	()	<ol style="list-style-type: none"> 1. Definition 2. Criteria of 3. Absence of callous ulcer 4. A delay in canalization associated with functional hour-glass contraction 	5. Functional hour-glass contraction only in critical stomach
{ Nothing definitely known, possibility of incubation		<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting 	<ol style="list-style-type: none"> 1. Crater localization 2. Nischen sign of penetrating ulcer 3. Pseudo Nischen sign 4. Organic hour-glass stomach
{ Where ulcer in the critical stomach (p. card. and p. med.)		<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting 	<ol style="list-style-type: none"> 1. Crater localization 2. Nischen sign of penetrating ulcer 3. Pseudo Nischen sign 4. Organic hour-glass stomach
{ Where ulcer in the horizontal stomach (p. pylor.)		<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting 	<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting
{ Localized adhesions (stratifications)		<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting 	<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting
{ Localized attachments on mass & other organs or structures		<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting 	<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting
{ Hyperperistalsis may add to diagnosis		<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting 	<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting
{ Antiperistalsis in ulcer at p. pylor.		<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting 	<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting
{ Peristalsis originates below incision		<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting 	<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting
{ Hyperperistalsis characteristic (double or triple waves)		<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting 	<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting
{ Type of peristalsis restricted to parts pylorica		<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting 	<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting
{ A. uperistalsis		<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting 	<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting
{ Hyperperistalsis (intragastric)		<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting 	<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting
{ True to index		<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting 	<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting
{ Use of stimulation of peristalsis		<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting 	<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting
{ Of ... corresponds to X-ray findings, especially if symptoms of perigastritis present		<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting 	<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting
{ If ... or ... not peristalsis is not due to ulcer		<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting 	<ol style="list-style-type: none"> 1. Definition 2. Cause 3. Specificity 4. Size, form and location 5. Eccentric dilatation of stomach resulting

maximum tenderness in appendicitis, McBurney's point is analogous. It is not necessarily over the appendix (52). There is a hyper-sensitive reflex locus in the abdominal wall. Can we use such localized points of tenderness which undoubtedly occur in gastric ulcer in conjunction with the X-ray for diagnostic ends? If uncomplicated ulcer in a certain location always gives rise to tenderness of a certain area, as in appendicitis, this may be possible. The third type of pain originating from gastric ulcer is due to (c) irritation of the parietal peritoneum by perigastritis secondary to ulcer (16, 4). The parietal peritoneum, or rather nerves in the subperitoneal connective tissue (46) can definitely localize such an irritation (49). If then we have symptoms of perigastritis that is, sensitiveness to jarring or motion (51) also a point of marked tenderness this point probably overlies the ulcer. It is usually found to do so. If such conditions then exist, and the point of tenderness registers with that site indicated by the X-ray as being the seat of ulcer, it adds positively to such presumption. If it does not correspond it detracts.

If a pressure-sensitive point be unaccompanied by symptoms of perigastritis, and especially if it fall without the shadow of the filled stomach as is usually the case, it should be considered as reflex and in the light of our present knowledge, of very limited diagnostic value as many other intra-abdominal conditions give rise to similar tender points. A number of writers claim without adequate evidence a relation between pressure-sensitive points and ulcer which is not warranted on physiological grounds. Thus they describe the tender point as rising and falling with respiration and its correspondence with a site indicated by the X-ray as being corroborative or the falling of a pressure-sensitive spot within the gastric shadow as indicative of an underlying ulcer. This in our opinion is not in accordance with the facts.

There is at times a palpable mass of suggestive nature and location encountered in ulcer cases. If such mass corresponds to an X-rayically suspected site in the stomach it is of positive value especially if there be

also clinical evidence of perigastritis, as an inflammatory ulcer mass of palpable size will almost surely be associated with a perigastritis resulting in an associated superficial point of tenderness from parietal peritoneal involvement. (Fig. 5.) A mass that does not correspond to an indicated site or tender point is almost surely not of ulcer origin. Fig. 30 shows an area of perigastritis caused by ulcers of the pars media. Irritation of the parietal peritoneum is proven by the adhesions connecting the ulcer site to the abdominal wall. In this instance a definite pressure-sensitive point, also painful on motion and jarring, exactly corresponded with a delay in canalization, indurism and a palpable mass. (Fig. 10.) The drawing (Fig. 30) also shows the functional hour glass stomach resulting from spasmodic ulcer contractures as it must occur in life though it is not seen at operation or post-mortem.

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PROBLEMS OF OBSTETRICAL PRACTICE

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IT was in 1850 that Dr. James P. White of Buffalo inaugurated clinical methods of teaching in obstetrics, so that in America practical instruction in this great art is some seventy two years old.

During this three quarters of a century the report is one of progress both in our knowledge and in our skill nevertheless, obstetrics to-day still deserves but a small measure of congratulation. In the great race of progress it continues to run a bad third with medicine and surgery.

Assuredly parturition is rightly enough to be regarded as a physiological process—in Sir J. Halliday Croom's telling phrase, a physiological process identical in the countess and in the cow—but its results in death and disablement render it frequently of the nature of a pathological calamity. The price of motherhood is still cruelly high. And though a part of this high price may be charged to the depraved social conditions of luxury and indolence, to poverty and overwork, to social wear and tear by far the larger share must be underwritten by the

medical profession. Who but ourselves are to blame if in Canada and the New England states some five hundred women each year die in childbed and some five thousand more are therein more or less permanently disabled, when we remember that a full three quarters of this number are the victims of septic infection, so often the technical euphemism for medical carelessness or neglect. Where practice is admittedly ignorant or imperfect the training is, without question, at fault. Let us frankly acknowledge it, that the fault in the practice of obstetrics is with our teaching, or our want of teaching. In part, too, I exonerate the teachers, for the subject, for obvious reasons, is extremely difficult to teach.

Accordingly it is no surprise that barely one half of our one hundred and twenty medical schools are pronounced as acceptable by a tribunal composed of ourselves and of this half namely sixty a mere six are admittedly possessed of adequate clinical training in obstetrics.

A recent and brilliant graduate of one of

Canada's leading schools informed me that his practical training as a midwife consisted in observing two normal deliveries at a distance of ten feet, and that his post-graduate course in the same subject at one of your pre-eminent schools was embodied in watching twelve such cases from a similar distance. Admirably trained was this man but not as an obstetrician—rather as an observer. And with such an instance in our minds, there may be some truth in the boast of the surgeon that in America it is safer to have one's abdomen opened for any chronic condition than it is to bear a child. Be this as it may it is true I think, that brilliant surgical achievements have blinded our academic vision—our general vision—as to what is the student's greatest need in the general practice of his profession. To the average student obstetrics is perhaps the subject of greatest importance. And it were almost better I sometimes think, if so-called classic surgery were banished altogether from our undergraduate curriculum.

In the *Journal of the American Medical Association* of January 1913 appeared an article entitled "The Management of Normal Labor." I, for one, feel very glad that this article was written for it has done so much to show us to ourselves. The article, you remember, professes to set forth simple rules of procedure in a case of normal labor. In all charity it seems to me that one may surely designate its technique as careless, and characterize repeated vaginal examinations, the pushing up of the cervix over the descending head, and the delivery of a refractory placenta by even gentle traction on the cord or by grasping its lower edge as middlesome midwifery. And yet these are the proceedures which the article, sometimes officially advocates. Throughout its pages internal examination and manipulation are regarded far too much as a routine and a matter of course and this, it seems to me is dangerous teaching.

I propose this evening to submit to you our teaching position in McGill University in respect to one or two problems of obstetrical practice. The only virtue that we can claim is that we recognize the inadequacy of our

clinical teaching and are striving in every way to remedy it.

The first problem is just this one before mentioned—the management of normal labor—the oldest problem, the commonest, and the most important. I have preferred the term "the problem of spontaneous parturition" as wider and more comprehensive, since the proper conduct of a normal labor should begin long before the onset of the labor pain. A good obstetrician should be wise before the event, and not alone at the actual crisis. It is not enough that he should go when he is sent for—when the woman expects to be in labor—to use the words of the *Journal's* article—but he should go to all his booked cases unsolicited some six weeks before the time.

I. THE PROBLEM OF SPONTANEOUS PARTURITION

As I have already intimated, the proper solution of this problem demands a careful examination of the pregnant woman some four or six weeks before the date of her confinement. If this is true in all cases, it is particularly true in women gravid for the first time. To omit such an examination in primipare is a sin of gross carelessness, no matter how busy the practitioner or how humble the patient.

The routine examination at such a time say at seven and a half months, is to include (a) a careful palpation of the abdomen, to determine the size of the child, the presenting part, and its position (b) the measurement of the pelvis, notably that of its external conjugate or Baudelocque's diameter and the transverse diameter of the outlet 19 cm. should be given upon the first diameter and 10 cm. upon the second, as anything short of these means trouble in delivery. At the same time, it is wise to palpate the depth and inclination of the pubic arch in selected cases, to verify the health of the vulva and urethra, and always to ascertain the condition of the nipples and breasts.

No internal examination need be made provided that all normal conditions are satisfied. If there is any doubt, the diagonal conjugate should be measured. There are here three outstanding rules—

1. In primiparae when the head presents it must at this time lie low in the pelvis, well engaged in the upper strait.

2. If the breech presents leave it alone, or as they have it north of the Tweed. For God's sake leave it be.

3. Do not forget the urine. Each week it is to be examined in its specific gravity and for albumen and sugar.

And now when labor calls, the physician goes forearmed. Sterile rubber gloves and a gown at least fresh laundered are not only wise but essential so for the patient, is a general bath, a soap-suds enema, and a shaving of the vulva hair. The physician by abdominal palpation ascertains whether or no labor has begun estimating by the sense of touch the strength of the uterine contractions; he rehearses in the same way the presentation and position of the passenger. The location of the fetal heart assists in this, and its rhythm indicates the vitality. If scarcely the sex of the child.

No further examination is at this time advisable. If however the first stage be prolonged, the condition of the cervix and the degree of dilatation of the os may be ascertained per rectum, by the gloved finger. This necessitates, however, a second pair of gloves.

In normal labor rupture of the membranes usually coincides with the full dilatation of the cervical canal. When this occurs a careful vaginal examination may be made; its object is to ascertain if the cord or any fetal member be prolapsed and to learn the position and likely mechanism of the presenting part. In primiparae where the presenting part has been from the first well engaged, this examination can safely be withheld. Such an examination means an entrance for the first time upon the field of operation and it should always be fearfully undertaken not as the fool who rushes in but as the fearful angel. The vulva and vulvar slit are cleansed with soap and water and the free use of some strong non-irritating antiseptic, and the cleansed parts are then isolated by sterile towels or fresh towels wrung out of a strong solution — the so-called "carbolyzed" or "perchloride" towel is perhaps the best.

During the second stage the patient must be kept in bed, and with the incidence of the pains chloroform or ether may be given. When the head "crowns," a choice must be made of the position for delivery. In these spontaneous cases I prefer the left lateral as it is in this way easiest single-handed to watch and protect the perineum. A good technique may be observed though this is not so easy as in the dorsal position. The delivery of the head is most safely effected in the interval between the pains by means of Ritgen's method, the left hand operating between the patient's legs and favoring the right extension of the head by pressing first the occiput and then the nape of the neck forward against the pubic arch. The head delivered, free the neck from any coils of cord, and guard as carefully as the passage of the head the transit of the shoulders. The left hand placed upon the uterine fundus follows it gently down in the final expulsion of the child.

The anæsthetic is now discontinued and the woman turned gently upon her back. The child is allowed to imbibe through its newly established pulmonary circulation the maximum amount of its own placental blood before the cord is cut. The mother's hips are now brought to the edge of the bed and a registering clamp placed at the vulva upon the dependent cord, while the uterine fundus is simply outlined with the hand, and the conduct of the third stage begins. In such normal cases, this is the stage that requires the most attention, patience, and skill. Ample time should be given for the spent uterus to recover while the fundus is simply guarded in the quiescent hand. At this time kneading of the uterus should not be employed, as this tends to prevent the formation of the central hæmorrhage by which the separation of the placenta is brought about. An armistice of at least thirty minutes should, if necessary, be declared. The fundal hand notes the gradual recovery of the uterus, and as the contractions strengthen the patient will again complain of pain. Extrusion of the placenta into the lower uterine segment or vagina frequently occurs spontaneously and is marked by the elevation of the fundus, the elongation of the

uterine axis, and by the escape, as measured by the position of the clamp of three or four inches of the dependent cord. When this occurs, the complete expulsion of the placenta may be at once achieved by a voluntary bearing-down effort of the patient herself or by a modified Credé the two walls of the uterus being firmly pressed together and the organ so compressed being pushed down as a piston into the pelvis. Separation of the placenta and its extrusion from the active portion of the uterus is a physiological process and is usually spontaneous. In most cases it is only its expulsion from the lower uterine segment, or vagina that requires assistance. While a retained placenta is common enough an adherent placenta is comparatively rare. No traction should be exerted upon the cord and only as a last resource is the placenta to be sought by an inserted hand.

Upon its delivery the placenta should be rotated several times in order to weave into a cord the following membranes, so as to ensure their complete removal. Kneading of the fundus may now begin and must be persisted in till the uterine contractions are well maintained. The fundus should be steadily watched by the doctor or the nurse for at least an hour after the delivery of the second ones. The perineum and the lower third of the vagina is carefully inspected and tears repaired by immediate sutures. In such a normal case the cervix need not be examined. It may be for the time left to care for itself.

The vulva should be carefully cleansed and covered by a sterile pad applied with a T bandage. Ergot need not as a routine be exhibited and the wearing of an abdominal binder may be left to the inclination of the patient.

The secundines floated in water should be always carefully inspected, especial care being taken to ascertain that the maternal surface of the placenta is intact.

Such is, very shortly, our teaching of the conduct of spontaneous parturition. The attempt is always made to instill and enforce the two ideals of cleanliness and a masterful inactivity. It is always declared that each man must master for himself the details of a practical consistent, workaday technique,

make it his very own and always employ it — the staff and scrip of his obstetrical pilgrimage. So provided the solution of at least 80 per cent of his obstetrical problems is assured and the verdict for three quarters of his work can be pronounced well done.

THE PROBLEM OF THE UNENGAGED HEAD AT THE END OF THE FIRST STAGE OF LABOR

By this I mean that the cervix is fully dilated or nearly so that the membranes are intact or only recently ruptured, while the head is not definitely engaged in the upper pelvic strait. I have chosen this problem as it is the one that frequently and often unexpectedly meets each one of us, and as upon its proper management so much depends. At first sight, too, it is often so simple a complication, so innocent of consequences and yet, if wrongly managed it so frequently leads to disablement or even disaster.

The gravity of such a condition in different cases is as widely asunder as the poles, according as the patient be gravid for the first time or not. In primiparae where the child's head during the later weeks of pregnancy should be always well engaged within the pelvis, it means in every case no little disproportion of the passenger. In multiparae this may or may not be so. In multiparous women, faulty positions of the head or undue obliquity of the whole foetal axis, as in pendulous belly may be the single, easily remedied causal factor. There is, moreover the guiding voice of the history of previous labors, and the soft parts below are roomy and well dilated. There is no comparison between the gravity of this condition in the two groups of cases, and since, if one can treat the more serious he can assuredly negotiate the less, I shall deal chiefly with this complication in primiparae.

I have chosen for discussion here solely those more difficult border-line cases. If you will, where there is only moderate disproportion between the mother and the child. Such cases are more common and more difficult to recognize and to treat than those where the disproportion is great, the diagnosis in consequence easy and the choice of interference arbitrary. A simple way to state this problem

is to say that here the true conjugate of the mother's pelvis is barely equal to the biparietal diameter of the head of the average child or to express it in figures, the true conjugate measures but 9 cm. while the biparietal diameter is 9.1 or 9.2 cm.—in a primipara, a conjugate vera of 9 cm. and an average child.

And here a word as to prophylaxis. It is once more the old story that, had you been aforesaid here, this had not happened. At least it is true that if the essential eight months visit had been paid the condition would have been recognised with some four weeks yet to go—four weeks in which to think, to act, or to get assistance. In all primiparae I urge again the imperative necessity of such a preliminary visit, though here and now it is too late.

The problem divides itself into two parts (1) How to ascertain the facts and (2) how to manage the condition. And again, the view only is taken of what we are to teach our average student.

1. How to ascertain the facts. The two essentials here are *method* and a *clean technique*. The rectum has of course been previously evacuated. Convince yourself first, with a catheter if necessary that the urinary bladder is empty and then of the presence and vigor of the foetal heart. The vulva and vulvar slit are carefully sterilized and full anaesthesia is induced, for a thorough internal examination must now be made. The diagonal conjugate is first carefully measured, either with the fingers or with a pelvimeter such as that of Gauss. Eleven centimetres, a trifle more or less, will be the reading. It matters not at all in such a minor contraction whether the type of the pelvis be a generally contracted, a justo-minor or a flat. In both these cases the true conjugate may be left to answer for the pelvis and this true conjugate is here 9 cm.

There now remains the estimate of the child's head. In such a case this is most readily achieved, I think by Müller's method of impression. An assistant grasps the brow and occiput of the head from above through the abdominal wall, and presses it firmly downward and slightly backward into the axis of the pelvis. When this is done the fingers in

the vagina, tracing the margin of the pelvic inlet upon the head, can estimate the degree of disproportion. If single-handed, Munro Kerr's modification may be used the thumb above the pubis measuring the degree of overlapping. Before the hand is withdrawn the actual position of the head is to be verified by complete palpation of the occiput or face and at the last the size of the pelvic outlet. It need not be repeated that these maneuvers are carried out under a rigid surgical technique.

Corroborative evidence as to the normal size of the child may be obtained by measuring the height of the uterine fundus as 35 cm. and the occipito-frontal diameter of the head as 11.5 cm. by such a method as that of Ellice Macdonald.

The total result of our findings is that the child's head jams with but slight overlapping in the upper strait, and that for delivery we must depend upon head molding and compression.

2. How to manage the condition. The first injunction and the last is, *do not hurry*. While carefully watching the condition of both mother and child leave the case alone. Statistics here are a great comfort, as they record in 80 per cent of such cases a spontaneous delivery and, as appeared last year in Williams' Questionnaire, the better results of the midwives in such cases was because they did not know enough to interfere.

Some help may be given by posturing the patient. The Walcher position does increase the true conjugate about 1 cm. and the patient should occupy this position at intervals as long as she can stand it. At the same time, during the pains moderate pressure from above, downward and backward, should be made upon the head. The Scotch midwives kneel these patients before a wooden chair resting upon the seat and the hands grasping the back above. In this attitude the uterine axis falls forward to correspond more nearly with the axis of the pelvis inlet, and engagement of the head is thereby promoted. At least it may be tried.

The first rule is, *do not hurry* and now the second is *do not turn*. Prophylactic version in contracted pelvis is for the expert. In his

hands, within certain narrow limits, it possesses certain usefulness. But these limits are too fine too difficult to estimate, for the average practitioner and any miscalculation means at the very least a murdered child. A publotomy or a Cesarean section are scarcely to be undertaken outside a hospital service.

And so the mother and child are carefully watched in any ordinary case for at least four hours. If after this time the head does not descend, axis traction forceps may be applied. There is here need for great care. Steady moderate traction at intervals with the

woman if need be in the Walcher position will soon decide the issue. It must decide the issue. No great force need be used. If the head does not advance the delivery of a living child must be abandoned, and our interests now are centered solely on the mother. With the forceps still applied, the child's head may be perforated between the blades and so delivered or a cranio-clast may be used. To the general practitioner the fault is not so great that it has happened once but grave fault is it if with this same woman it happen once again.

THE MALIGNANCY OF GIANT CELLED SARCOMA

By J. CLARK STEWART, M.D. MINNEAPOLIS, MINNESOTA

WHAT is a giant cell sarcoma? Authorities answer a sarcoma which contains a large number of giant cells. Just how many giant cells seems undetermined so long as there are enough to give a distinctive picture.

The sarcoma matrix in which the giant cells lie is the essential element in this tumor and is responsible for its clinical features. This is usually of a spindle or mixed cell type. Are these tumors malignant? There has been a great deal of writing lately to show that they are not, and statements are freely made that they never form metastasis and possess but limited malignancy.

Both of these propositions I wish to disprove by the citation of observed cases. These tumors occur in relation to bones as either periosteal or central growths, and in either situation are of slow growth and delayed malignancy. Either form can, in my experience cause death, and the central form has shown the more malignancy.

Case. A man aged 35 developed a small tumor at the base of his great toe. This grew slowly and after time presented the symptom of pulsation to so marked a degree that the attendant diagnosed aneurism and tied the dorsalis pedis artery without relief. The disease continued to progress and tumor developed at the middle of the tibia above.

At this time the patient came into the hands of Dr. James E. Moore with whom I saw him in consultation. Dr. Moore amputated the leg above the second tumor and it was noticed that the external saphenous vein was plugged with sarcoma at the site of amputation, and hence below the primary tumor. The tibial tumor was central and had caused pathologic fracture.

This patient died after few months with local recurrence in the stump and a metastatic tumor in the brain. The primary tumor was central in the metatarsal bone of the great toe and had perforated the bony shell, giving rise to the symptoms of bone aneurism. It was a giant cell sarcoma containing many large giant cells in a mixed cell matrix with many narrow cells. The secondary tumor in the tibia was true to type, as was the plug in the vein. The total duration of this case was under ten years.

Case. A cowboy aged 30, gave history of breaking his left arm while mounting his pony. The fracture failed to unite and after three months he came to Minneapolis to Dr. W. E. Rochford, with whom I saw him in consultation. The arm at this time was greatly swollen from elbow to shoulder and crepitation was evident. I made tentative diagnosis sarcoma, which was confirmed by an exploratory incision. The arm was amputated at the shoulder removing all suspicious tissues. Recurrence as prompt and death occurred within six months.

The arm showed central giant cell sarcoma which had destroyed the bone from four inches below the shoulder to within two inches of the elbow. The muscular tissue was deeply infiltrated by the tumor. The microscope showed typical giant celled sarcoma, with spindle cell matrix.

These patients died of sarcoma of the giant celled type both originating in the medullary cavity of a long bone, so it must be admitted that giant celled sarcomas do cause death. The first case developed metastasis which must also be admitted.

I am of the impression that these central tumors are fairly benign so long as they do not perforate the bone, but that after perforation they become malignant and cause death as other sarcomas do.

It is easy to see how the idea of benignancy has arisen in these cases. The X ray has made diagnosis easy and early and has allowed them to be thoroughly removed locally before marked malignancy has developed. Few cases are neglected at this day and it is natural that local nonrecurrence should spell benignancy. The same conclusion could as justly arise in the mind of a present day student in regard to ordinary cyst-adenoma of the ovary. He sees the diagnosis made and the cysts removed with nonrecurrence, and his conclusion would be that such cysts were absolutely harmless, instead of being regularly fatal when allowed to take their natural course.

The giant celled periosteal sarcoma of the gums epulis, makes the nearest approach to benignancy of any tumor histologically diagnosed sarcoma, but even here occasionally there are cases that take on malignancy as shown by repeated recurrence and extensive growth.

I was much interested in an article in the February number of the Annals of Surgery by Dr. George Barrie on chronic hemorrhagic osteomyelitis (synonym giant cell medullary sarcoma). From the description given of the cases it does not seem to me that the diagnosis

of central giant celled sarcoma was justified but rather that of nonsuppurative osteomyelitis as the description of the gross and microscopic findings tally exactly with those of the cases I described as nonsuppurative osteomyelitis before the Western Surgical Society in December 1910. Here again comes the question whether giant cell sarcoma can be diagnosed without the presence of sarcoma. Certainly the results of microscopic examination reported by Dr. Barrie would not permit of a diagnosis of sarcoma. He states that a few giant cells were found by search of a large number of slides. Certainly not the microscopic picture of a giant cell sarcoma where many giant cells can be found in most fields. A loose fibrous structure infiltrated with small round and epithelioid cells certainly can not be diagnosed sarcoma, but is distinctly the picture of a chronic inflammatory process.

The other cases described furnish no microscopic findings the diagnosis being made entirely on clinical and even in one case, on skiagraphic findings. Certainly a unique way of diagnosing a specific variety of sarcoma.

It is, I think, unfortunate to use the term sarcoma unless you mean sarcoma and it must always be remembered that a giant celled sarcoma is only a sarcoma containing giant cells and its malignancy depends upon the character of the sarcoma matrix. The most usual type of matrix is spindle celled hence these tumors are slow-growing and less malignant than many other types of sarcoma.

The cases cited in this paper while few in number certainly prove malignancy and one fatal case is enough to disprove all theories of nonmalignancy.

OBSERVATIONS ON THE ABBOTT TREATMENT OF ROTARY LATERAL CURVATURE OF THE SPINE AND DETAILS OF THE TECHNIQUE

By SAMUEL KLEINBERG, M. D. New York City

THE Abbott method of treating rotary lateral curvature of the spine depends on the theory that the spine is bent laterally and is rotated easiest when relaxed. It has been proven on the cadaver and in the living being that the vertebrae and more especially the dorsal vertebrae bend laterally and rotate freely in the flexed position but are locked and immobilized in the erect or hyperextended posture. The Abbott method is a treatment in flexion. Pressure solely over the region of the deformity particularly when the upper and lower portions of the trunk have been fixed, pushes the spine forward, and extends and hence locks the vertebrae against any corrective influence. This, the main principle of former methods of correction accounts for so little progress in the past in the treatment of fixed lateral curvature of the spine.

Hence, in the Abbott method not only must we during the application of the plaster jacket attain flexion, but it is equally important in the subsequent treatment to pad or pack the jacket only in such way as to maintain, and possibly increase the flexion. There appears however to be a limit to the amount of flexion the patient is to be placed in, for the body in extreme flexion does not lend itself to much side-bending or rotation.

Flexion and relaxation of the body are obtained in this method by placing the patient in a hammock made of canvas or muslin suspended in a rectangular gas-pipe frame.

Beneath this there is another frame of similar dimensions, and to the bars of both frames are attached the fixing or corrective bands to be spoken of later.

The preparation of the patient plays an important rôle in the treatment. Felt one half to three quarters of an inch thick is used, this being a more certain protection to the skin than cotton or flannel. One or two thicknesses of felt are placed over the pro-

jecting ribs and convexity of the thorax, reaching laterally from the spine to the anterior axillary line, and in girls over the mammary region. This pad should fit well around the chest and be secured between two undershirts. A removable pad of two or three layers of felt should be placed over the concavity of the posterior surface of the chest; this pad should cover only the hollow part of the chest and in cases of compensatory lumbar curves should not extend over the prominent lumbar region. At either lateral extremity this pad should be somewhat thicker than in the middle, so that near the spine when the pad is removed, the cast will be one or two inches distant from the body sloping gradually away from the most prominent part of the deformity while in front the cast, instead of being rounded and hugging the chest well, will at the anterior axillary line stand away from the ribs. Another removable pad of one or more thick nesses should be placed over the ribs in front of the chest on the side of the deformity when this pad is taken out it allows for expansion of the chest and ribs on that side. These removable pads are placed between the second and third undershirts, and are taken out as soon as the jacket is completed. In all the patient has three shirts under the plaster. Protective pads are placed over the crests of the iliac bones and over the sacrum, although the latter in my experience has not seemed essential.

The patient thus prepared and placed in the hammock, the extremities of the trunk are fixed by means of bandages of unyielding material, like canvas, four to five inches wide. The thigh on the side of the deformity is fixed by a bandage that pulls directly backward. The pelvis is then fixed by a bandage which, attached to the frame on the deformed side, passes under the body over the hip on the concave side, in front of the

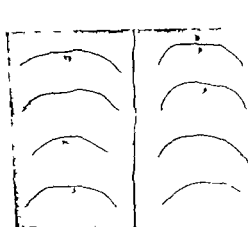


Fig. 1

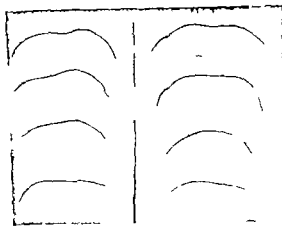


Fig. 2

pelvis and is directed backward over the hip of the deformed side. It is advantageous to have this bandage adjusted to pull slightly downwards against the upward pull of the band fixing the shoulder girdle. The latter bandage is next applied this, tied to the frame on the deformed side, passes under the neck, over the arm of the concave side and in front of the neck. Before this bandage is secured the legs are raised to an angle of 60 or 75 degrees to increase the flexion of the body the chest is twisted so that the deformed side is brought forward and the hollow side backward, the high shoulder is lowered and the low shoulder elevated as far as the patient will permit. Another bandage now embraces the low shoulder and pulls it forward. Two correction straps are now attached to the side of the frame next to the concave side of the chest, and pass in back of the chest over the deformity onto the front of the chest one of these bandages is then utilized to pull directly sidewise and obtain as much lateral correction as possible, while the other is directed backward over the prominent ribs, tending to correct the rotation of the ribs and corresponding vertebrae. These are the most important bands as they correct the lateral bend and rotation. We thus have the patient flexed and bent and twisted in the direction opposite to that of the deformity.

Plaster bandages are then applied with

reinforcing pads over the convexity around the pelvic and shoulder girdles, and in front opposite the hollow. Fenestrae are next cut out, one very large window over the concavity of the chest behind. This must extend forward to or even slightly beyond the anterior axillary line, so that the front pads will push the chest directly backwards and not laterally to the side of the deformity. An oblong-shaped window is cut out over the region of the sternum, through which the anterior pads are inserted. Another window is cut out of the plaster in the back, a little to the outer side of the most prominent part of the deformity and the fourth and last window is cut in the axillary region of the same side. The last two windows must be so placed that felt pads going through them will tend to push the chest forward and to the opposite side. In trimming the jacket the lower border must be made exceptionally low in the back and about an inch above the pubic symphysis in front. Above the low shoulder must be allowed to fall forward by cutting the plaster very low in front and high in the back exactly the opposite must be obtained for the high shoulder. We must have a jacket that is very much longer on the concave side than on that of the deformity. During the application of the jacket the patients all complain of tightness across the chest and difficulty in breathing this is immediately



Fig. 3

relieved when the removable pads are taken out.

Padding is begun several days after the application of the jacket and is repeated as often as the patient can stand it. We now come to a very important and often to the patient, the severest part of the treatment. If the jacket has been accurately applied each pad causes discomfort and pain and as the pads increase in number the discomfort increases. At times pain after padding is only temporary lasting from a few hours to a day or two but often it continues until either one or two pads are removed or if too many pads have been inserted and the chest has come close against the jacket, the latter has to give way to a new one. Most of the pain is on the side of the deformity and over the sternum. The elevation of the low shoulder almost invariably induces pain, especially in the neck, and numbness in the arm. Very often there results a marked subluxation of the acromioclavicular joint of the low shoulder that does not readily reduce

itself when the jacket is removed. From six to twelve pieces of felt can be placed in front and half as many on the side before the jacket must be changed. The time spent in accomplishing this amount of packing varies from a few weeks to two months, depending upon the rigidity of the spine and the tolerance of the patient. Almost all patients and especially after several pieces of felt have been inserted suffer from insomnia. It is often very difficult for them to find a comfortable position many perhaps most of them feel best in a hammock while others relieve their discomfort by leaning forward on some object. Shortness of breath and pain interfere most with packing. In two instances vomiting followed the application of the jacket for one or two days, while frequently loss of appetite persists for many days. In two cases, the removal of the patient from the frame was followed by an extreme pallor and marked prostration that persisted for several hours. One of the commonest sequelae is a disinclination to physical



Fig. 3, b.



Fig. 4. a



Fig. 4. b

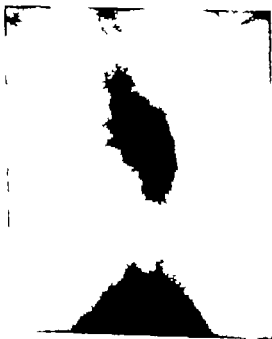


Fig. 5. a



Fig. 5. b



Fig. 6



Fig. 6, b.

exertion of any kind a tiredness and weakness which in one case did not permit the patient to stand up or walk more than two or three minutes at a time. In most cases the pulse rate was accelerated. In a series of 10 cases reviewed in one afternoon, in 6 the pulse ranged between 110 and 132 in 3 others

between 84 and 96 while in one the pulse was 80 per minute before the application of the jacket and 120 after the plaster was put on and continued at that rate until the jacket was removed.

In many cases the anteroposterior diameter of the chest on the concave side is markedly reduced. In three or four of my cases this was so severe that the chest wall was no more than two and a half to three inches thick. Due to this diminution in the size of the chest, the cardiac apex was palpable and in a few instances visible on the posterior surface of the chest. Nor is this compression of the concave side of the chest always accompanied by a corresponding reduction of the deformity. A very distressing though not dangerous sequel to the front padding is, especially in thin subjects, a pronounced incurvation of the chest this, however does not persist for more than a few days after the pressure is relieved.

In all the cases treated it has been possible in the frame to produce side-bending and rotation of the chest, and the subsequent

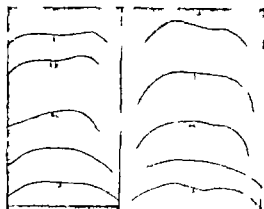


Fig. 7



Fig 8 a.



Fig 8 b.



Fig 9 a.



Fig 9 b.



b
Fig. 3.

packing has increased this and in most cases diminished the deformity, but in the majority of cases, the moment the cast is cut and the patient stands up the deformity relapses. The amount of relapse depends on the correction obtained in the jacket: the more the chest is stretched and the spine pushed laterally the less will the spine relapse. An X-ray picture taken of a spine in a jacket will show much less deformity than an X-ray of the same spine outside of the jacket. This relapse, however takes place I believe, only so long as the spine is not entirely overcorrected. In the overcorrected cases the spine goes back very little outside of the jacket. The problem resolves itself into one of complete and thorough overcorrection before the jackets are removed.

It has been remarked that, due to greater expansion of the lungs in the upper part of the chest, the high cervico-dorsal deformities should respond very rapidly to this method of treatment. In three cases in which I persisted for four or five months, I obtained absolutely no improvement. Nor do I see how with the present form of the jacket, it is possible to influence a deformity that involves the lower half of the neck, for raising

the low shoulder so high that the clavicle is brought up against and parallel with the neck has not made any perceptible difference possibly if these jackets are made on the style of Calot jackets, corrective pressure may be of some service.

In all, 31 cases have been treated since January of this year. Of these 10 gave up the treatment after one or more months, due mostly to the inconvenience and pain experienced. In most of these however improvement had been observed. Three cases were abandoned because no improvement was obtained after several months treatment. 18 are under observation and are seen two to four times a week. All cases treated were ambulatory and none were given morphine. In two or three instances, moderate doses of codeine were given for the pain and discomfort the relief was slight and did not warrant the continuance of the drug in the doses administered, and hence was given up.

Of those cases under observation one, a girl of seventeen with a severe right dorsal and left lumbar curve under treatment for nine months, during which time she has had seven jackets, has not made any perceptible progress. Thirteen cases have improved,



Fig. 2.

some very markedly and in two or three instances almost corrected. Four cases have been overcorrected.

Of those cases that gave up treatment, one girl thirteen years old, with a moderate left dorsal and right lumbar curve was corrected though not overcorrected at the time she discontinued the treatment when seen eight weeks later having worn during this period a very ill-fitting jacket and not taken any exercises, her deformity had completely recurred. Another girl of fifteen whose deformity was readily overcorrected in the jacket could not retain any of the correction when the plaster was removed she however was under treatment only two months.

The following is a review of some of the cases treated.

H. D. (Fig. 2) boy 9 years old right dorsal curve of moderate severity. On March 1902, corrective jacket was applied this was kept on until July 1902, with very little packing when removed, the deformity was found to be reduced. Another jacket applied, felt pads now and when removed on August 7, 1902 the spine was observed to be in an overcorrected position. Compare Fig. 2 containing tracings of the plaster mold of patient back taken March 1902 and Fig. 3, which shows



Fig. 3.

tracings of mold of the same back taken August 7, 1902. The difference is especially evident on the seventh dorsal level (7 d) and the dorso-lumbar region (DL).

F. V. (Fig. 4) girl 7 years old right dorsal and left lumbar curves of moderate severity. Treatment begun January 6, 1902 and discontinued May 3, 1902 several jackets applied during this time. Tracings taken before and after treatment (Fig. 4 a and b) show the correction, this is also shown by the photograph of the girl's back (Fig. 3 a and b). From May until the time of the writing of this paper this patient has gone without any mechanical support, but has retained her correction.

M. N. (Fig. 4) a boy 6 years old right dorsal curve as shown by X-ray taken May 1901 in Fig. 4. Four corrective jackets applied and on September 1902, as shown in X-ray (Fig. 4 b) the spine is overcorrected. This boy's deformity was of a mild degree.

J. B. (Fig. 5) boy 5 years old right dorsal left lumbar curves as shown in X-ray (Fig. 5, a) taken August 6, 1902. Several jackets were applied, and on October 1902, as shown in X-ray (Fig. 5, b) and in photo (Fig. 6, a and b) taken September 4, 1902, the patient spine is overcorrected.

O. J. (Fig. 7) girl, 5 years old severe right dorsal and left lumbar curves. This patient has had nine corrective jackets during period of nine



Fig. 2.

months. As also by tracings of casts of her back (Fig. 7 a and b) she has been greatly improved. X-rays of this spine do not agree with the external appearance of the patient's back, as they show no improvement. Moreover the patient is unable to retain outside of the jacket the corrected position in the plaster jacket.

I. B. (Fig. 8) girl 3 years old right dorsal and left lumbar curves of moderate severity. This patient began treatment June 9, and had several jackets pulled between this date and October 9. As the X-rays show (Fig. 8 a and b) there is very marked improvement. This was the only patient of those not overcorrected who during a period of three weeks, in which her treatment was interrupted, did not lose any of the correction she had been given in the jacket. During this time however she exercised enthusiastically.

J. M. (Fig. 9) boy 3 years old severe right dorsal and left lumbar curves child rachitic. This patient is under treatment since April 4, 9, and

shows improvement as seen in X-rays (Fig. 9 a and b).

K. E. (Fig. 1) girl 9 years old, severe right dorsal and left lumbar curves as also in Fig. 9, a. This patient is under treatment about 7 months. Pictures taken in September (Fig. 9, b and c) show marked improvement. X-rays of this patient before and during treatment show very slight improvement and do not agree with the changes in the contour of the back shown by the photos.

P. B. (Fig. 2) boy 7 years old. Right dorsal and left lumbar curves. This patient was treated from March 9 to June 27, 9, and showed improvement as seen in his X-rays (Fig. 2 a and b).

S. H. (Fig. 3) This picture is of a girl of 9 years of age who has been under treatment several months and is greatly improved. Not the marked incurvation of her chest. Incidentally it might be mentioned that in this case it was easy to correct the rotation of the ribs and vertebrae but the lateral deviation of the spine has not yet been reduced.

J. G., child 3 years old rachitic severe left dorsal and right lumbar curves. The deformity in this case, as overcorrected, about three months. The mother then took the child home and, against my advice removed the jacket. When this patient was brought back several weeks later the deformity had completely recurred.

In conclusion I should say that Abbott's method of treating rotary lateral curvature of the spine is a severe one, requiring much patience on the part of both the subject and the physician. Many cases can be corrected especially the milder ones, by this method but it corrects very slowly in most instances, and hence the treatment must be a prolonged one.

Of the 31 cases here reported 4 were private patients; 5 from Dr. Nathan's clinic at Mount Sinai Hospital and the rest from Dr. Whitman's clinic at the Hospital for Ruptured and Crippled. For the privilege of using their material, I desire here to express my thanks to Dr. Nathan, and especially to Dr. Whitman for his liberal advice and encouragement.

BENIGN AND MALIGNANT OVARIAN CYSTS

A REPORT OF 1000 SPECIMENS

B WILLIAM CARPENTER MACCARTY M D AND WALTER E. SISTRUNK, M D LABORATORY OF
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A N examination of the literature on the subject of ovarian tumors, especially ovarian cysts shows that over 1,000 articles have been published since 1903. In the light of our present general knowledge of the subject, a review of such a wealth of recorded observations would be only of historical interest.

Most surgeons and physicians have a good working knowledge of large cystadenomata and simple cysts, dermoids, the so-called corpus luteum cysts (hemorrhagic cysts) and parovarian cysts. These comprise the cysts which are technically most easily diagnosed and removed. The differential diagnosis of small ovarian cysts is, however, very difficult but from a technical standpoint the differential diagnosis of these has been of no immediate importance to the surgeon.

Cysts smaller than a hen's egg possess qualities which have a wide and very different prognostic significance. The main object of this paper is to call attention to the possibilities which may arise from these qualities and to present a synopsis of our findings in a study of a large number of ovarian cysts.

The material used for this investigation consisted of ovaries which had been removed for definite pathologic conditions, and apparently normal ovaries which had been removed during the course of complete hysterectomies for uterine carcinomata. Ovaries removed at autopsy were also used for comparison.

For the last six years one of us (MacCarty) has had charge of this surgical laboratory in which, during this time, a record of one thousand ovarian specimens has been made. During this period both classification and nomenclature have changed.

The material which was examined consisted of 1,000 specimens, from February 3 1905

to August 1 1912. The various tumors occurred in the following frequency:

Hemorrhagic cysts	14
2. Non-hemorrhagic cysts	45
3. Papillary and carcinomatous cysts	63
4. Dermoids	98
5. Parovarian cysts	74
	1,000

The duplicity of ovarian cystadenomata and dermoids can only be approximately determined from surgical material. The surgeon often leaves a small ovary without knowledge of its exact nature or through conservatism. We have records of dermoids occurring in both ovaries 14 times (14 per cent) in 98 cases and carcinoma occurring 7 times (7 per cent) in 97 cases.

For special examination and description a report, of which this is the first paper of 100 specimens were taken as representative of the 1,000 which had been recorded. These represent all the conditions which were seen in this material. Each specimen was photographed grossly either in its fresh condition or in a fixed condition. Gross sections were made through the whole tumor and gross photographs were made of these sections. Blocks were then taken, embedded in celloidin cut and stained with hematoxylin and eosin.

With our present knowledge of physiologic and pathologic processes and their cognizable signs and symptoms it is impossible to express diagnostic, macroscopic, microscopic, and prognostic characteristics in a diagnostic term. For this reason a method of reporting ovarian cysts similar to that used in reporting our gopher specimens seems most applicable and will be used in this paper. By the use of such a method of describing specimens of gophers valuable assistance was rendered the clinician and he has been stimulated to cor-

Y Y State J October 1912.

Read before the Canadian Medical Association, August, 1912.

The number does not represent the complete material, but sufficiently large for study of the conditions back one back. Solid tumors were not considered in this investigation.



Fig. 4. A pedunculated corpus luteum.

relate clinical sign and pathologic finding more accurately.

The principal distinguishing feature in ovarian cysts is the lining epithelium. This is apparently differentiated or specialized and is most important.

Three different linings are seen viz. *round or oval many-layered epithelium* (Fig. 21 a and b) *columnar epithelium* high or low (Fig. 21 d) and *lutein cells* (Fig. 2). These three types of cells have apparently three different functions. Whether or not the columnar epithelium and the many-layered epithelium may develop from each other is unknown. The only indication that this may be possible is the presence of both types in the same cyst (Fig. 10). Upon these fundamentals all neoplastic cysts of the ovary may be classified and described.

SIMPLE CYSTS

The simplest cyst (Figs. 3 and 4) which one finds possesses a wall the inner surface of



Fig. 3. Multiple simple ovarian cysts.



Fig. 5. Photomicrograph of section through the wall of corpus luteum, showing large lutein cells.

which is smooth and is composed of from two to six layers of small oval or round epithelial cells (Fig. 5). The content of such a cyst is a clear fluid.

When a Graafian follicle ceases to be a follicle and becomes a simple cyst of this description is not known. That such cysts originate from Graafian follicles is to be strongly suspected because they have a similar lining and contain apparently the same

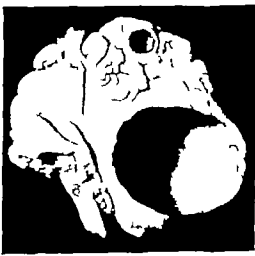


Fig. 4. Large and small simple ovarian cysts.



Fig. 5. Photomicrograph of the wall of simple ovarian cyst.

clear fluid. Such a cyst may attain the size of a human head. Their simplicity of structure and contents may allow the utilization of the term simple cyst in contradistinction to the apparently more highly differentiated cyst which is lined by columnar epithelium (Fig. 21 c) and which secretes a complex, highly albuminous fluid.

The secondary descriptive features of simple cysts consist in their being unilocular or multilocular and whether or not hemorrhage has occurred into the wall or into the interior (Figs. 6, 7, 12 and 13). They may be briefly described in pathologic reports as follows:

Simple { unilocular or multilocular } cyst or
 Simple { unilocular or multilocular } { intracystic hemorrhagic or extracystic hemorrhagic } cysts



Fig. 6. Simple ovarian cysts with hemorrhagic walls.



Fig. 7. Simple ovarian cysts with hemorrhagic walls.



Fig. 8. Ovarian cystadenoma showing pseudo-neoplastic contents.



Fig. 9. Ovarian cystadenoma (from the same case but from the opposite ovary).



Fig. Photomicrographs of the lining epithelium of one small cyst.

CYSTADENOMATA

This group contains all of those cysts which are lined by columnar (Figs. 8, 9, 10, 11, 15, 16, 7, 18, 19 and 20) or cuboidal epithelium and which contain a highly albuminous, pseudomucinous or gelatinous material. Cysts with these characteristics may be described as simple cystadenomata. They may be single or multiple. They may present hemorrhage into the cavity of the cyst (Fig. 11) or into the wall. The epithelial lining may be hyperplastic and thrown into folds or papillomata (Figs. 15, 16, 17 and 9) which have connective tissue pedicles and are covered with epithelium which is continuous with that which lines the cyst. Such papillomatous neoplasms may be intracystic (Figs. 15, 16 and 17) or extracystic (Fig. 18). The extracystic papillomata are the result of destruc-

tion of the wall of the cyst and growth into the abdominal cavity (Fig. 18). The epithelium of ovarian cyst adenomata like that of the breast, does not always produce intracystic papillomata. On the contrary it may grow into the underlying tissue and present itself as a true adenocarcinoma, thus forming a solid mass in the walls of cysts (Fig. 20). The essential characteristics may be presented in the following descriptive terms:

Unilocular or multilocular	simple or intra- or extracystic hemorrhagic	{ intracystic or extracystic papillomatous or carcinomatous }	cystadenoma.

HEMORRHAGIC CYSTS

The line of demarcation between a normal corpus luteum (Figs. 1 and 2) and a so-called corpus luteum cyst is just as indefinite as that between a Graafian follicle and a simple cyst. In practice both the surgeon and the pathologist are prone to call any hemorrhagic cyst smaller than the fist, or perhaps a child's head a corpus luteum cyst. The limits of size of a corpus luteum are unknown.

In view of the fact that our knowledge on the subject is indefinite, it seems to the writers that such definite term as corpus luteum cyst is not a legitimate one. It allows the surgeon to unconsciously confuse those who accept his operative reports. The diagnosis is one for the microscope and should only be made after 10 to 15 cells have been demonstrated in the border.



Fig. Small hemorrhagic ovarian cystadenoma.



Fig. 12. Large hemorrhagic cysts ("tarry cysts") Epithelium not demonstrable.

Fig. 13. Large degenerating cyst. Epithelial lining is destroyed origin is therefore unknown.

Hemorrhagic cysts of the ovary have different characteristics. They may be hemorrhagic simple cysts (Figs. 6 and 7) hemorrhagic cystadenomata (Fig. 11) or large corpora lutea (Fig. 13). The differentiation between these grossly has been impossible in the writers' experience.

The clinical significance of all ovarian cysts, i. e. the simple cysts, the simple papillary and carcinomatous cystadenomata, and the hemorrhagic cysts, depends upon the life history of their lining epithelium. Ordinarily the Graafian follicle should run its natural course

discharge its ovum and recede with the formation of a corpus luteum. In case the Graafian follicle continues to develop instead of rupturing and forming a corpus luteum a so-called simple cyst occurs with the characteristics described above.

Experience demonstrates that malignant ovarian cysts do not possess epithelium of the type which one finds to be the dominating type in simple cysts. Their morphologic sign of malignancy is the irregular hyperplasia of the columnar epithelium of the cystadenomata. In the writers' experience all carcinoma

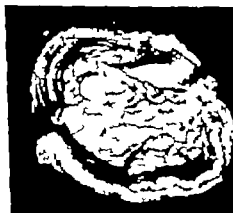


Fig. 4. Interior of an ovarian abscess

Fig. 5. Intracystic papillary ovarian cystadenoma.



Fig. 6.

Fig. 6. Intracystic papillary ovarian cystadenoma.

Fig. 7.

Fig. 7. The inner surface of an intracystic papillary ovarian cystadenoma.

Fig. 8.

Fig. 8. Intracystic papillary ovarian cystadenoma.

tous and papillomatous cysts have apparently originated from cystadenomata.

The question of the origin of the cystadenomata has been answered in literature by hypotheses rather than proof. Pflüger's tubules, Wolffian tubules, rests, and Graafian follicles have all been held theoretically responsible. In the experience of the writers there is only one fact which points toward at least, one source of the cystadenomata.

Cystadenomata in the ovary bear a certain resemblance to cystadenomata in the breast. This is especially true in the light of hyperplasia of the lining epithelium. In the case

of the normal hyperplastic mammary epithelium one finds two distinct layers, the inner layer of which is absent in cystadenomata and carcinomata. In ovarian cystadenomata and carcinomata the same phenomenon is true. During extensive hyperplasia the inner row disappears. The evidence which points to the occurrence of the same process in the ovary may be seen in the accompanying photographs (Figs. 21 and 22). The first picture (Fig. 21 a) presents the lining wall of a Graafian follicle; the second (Fig. 21 b) that of simple cysts. In the second (Fig. 21 b) the epithelium is similar to that of the Graafian follicle. In the third (Fig. 21 c) two types of epithelium are readily visible. The inner row (the row next to the lumen) con-

MacCarthy T. South Surg. & Gynec. Soc. Proc. Chgo. Session. 24 J. April 1901.



Fig. 21. Low power photomicrograph through the wall of papillary ovarian cystadenoma.



Fig. 22. Carcinomatous ovarian cystadenoma.

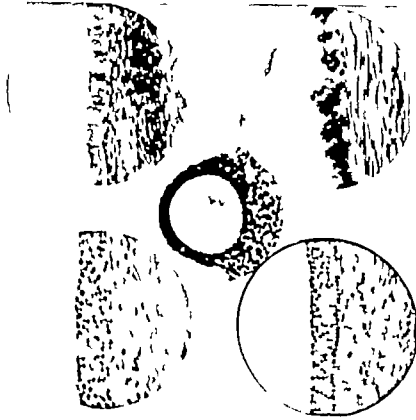


Fig. 1. (a) Normal alveolar lining epithelium of the lung. (b) Hyperplastic columnar epithelium lining the bronchus. (c) Hyperplastic columnar epithelium lining the bronchus. (d) Hyperplastic columnar epithelium lining the bronchus.

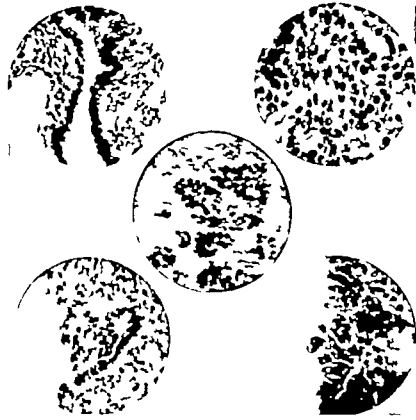


Fig. 2. (a) Normal alveolar lining epithelium of the lung. (b) Hyperplastic columnar epithelium lining the bronchus. (c) Hyperplastic columnar epithelium lining the bronchus. (d) Hyperplastic columnar epithelium lining the bronchus.

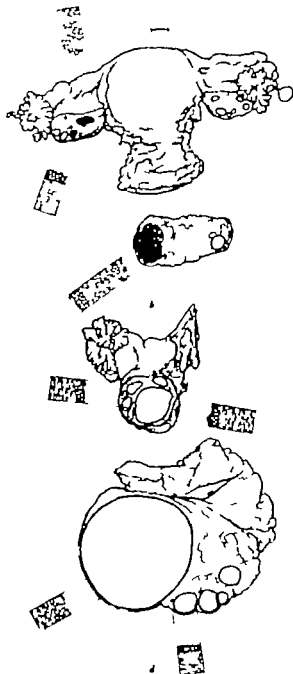


Diagram I—(a) Normal ovary containing Graafian follicles and corpus luteum (b) corpus luteum (c) simple ovarian cyst (d) simple ovarian cyst (e) simple ovarian cyst

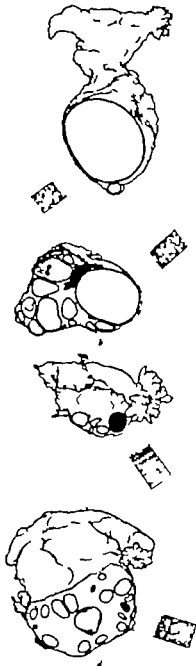


Diagram II—(a) Ovarian cystadenoma (b) extracystic hemorrhagic cystadenoma (c) intracystic hemorrhagic cystadenoma (d) intracystic hemorrhagic simple cyst (e) intracystic hemorrhagic simple cyst

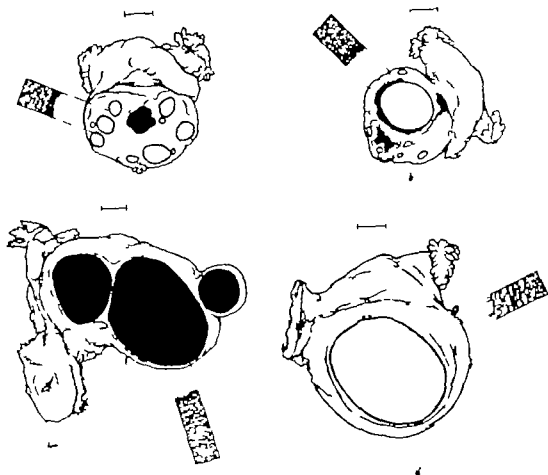


Diagram III — (a) Intracystic hemorrhagic simple cysts (type unknown) (b) extracystic hemorrhagic cysts (type unknown) (c) intracystic hemorrhagic cysts (tarry cysts — origin unknown) (d) large cyst with fibrinous contents (type — cyst unknown)

cysts of many layers of round or oval cells, which rest upon the outer columnar row. The fourth picture (Fig. 31 d) presents a cyst wall lined by columnar epithelium.

This series of specimens is very striking, in view of the behavior of the mammary epithelium. It is especially interesting when associated with another case in this series (Fig. 10) which shows the lining of a single cyst, which presents three distinct features i. e. the many layered epithelium of the Graafian follicle and simple cyst the columnar epithelium of the cystadenoma, and the papilloma of the intracystic papillary cyst adenoma.

These facts suggest a process the stages of which have been termed entities. All unruptured follicles most probably do not pass through all stages just as all cysts of the breast do not become cystadenomata. These observations do not interfere with the possibility of origin of cystadenomata from Pflüger's tubules, Wolffian tubules, or Wolffian rests.

In view of these facts, certain clinical and operative questions arise.

1. When operative procedure consists of artificial rupture of a cyst without removal what are the chances of rupturing a cystadenoma? This question may be answered by

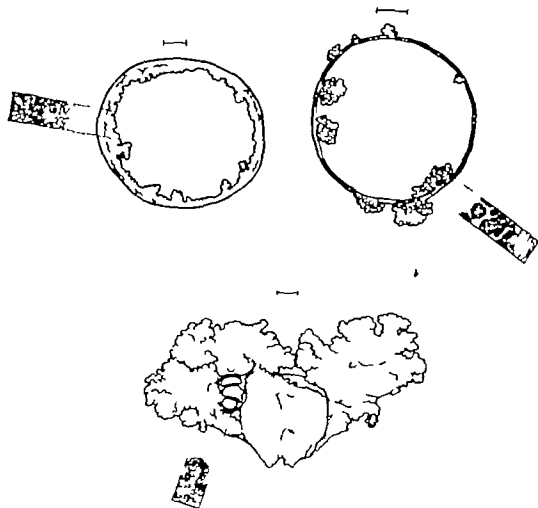


Diagram IV — (a) Ovarian abscess (b) intra and extracystic papillary ovarian cystadenoma (c) bilateral extracystic papillary ovarian cystadenoma.

saying that small ovarian cystadenomata occur in a hæmorrhagic or non-hæmorrhagic state (Figs. 8, 9, 11) and that their differentiation from simple hæmorrhagic or non-hæmorrhagic cysts is determinable only by the microscope.

3. Would the artificial rupture of a small ovarian cystadenoma prevent further development? This is important, but is unanswerable at present. Experience teaches that large cystadenomata how-

ever certainly continue to develop after rupture.

3. In young individuals with cystic ovaries which the surgeon ordinarily removes or punctures, would it not be more conservative to determine the exact microscopic nature of a portion of the cyst wall during operation. By so doing a simple cyst may be ruptured without destruction of an ovary and cystadenomata will not be left in an attempt to conserve ovarian tissue.

REVIEW OF THE LITERATURE AND CASE REPORTS OF RUPTURED UTERUS

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FOUR complete ruptures of the pregnant uterus have been treated at the Presbyterian Hospital during the past twelve years. Through the courtesy of Dr Webster I am reporting three cases which I saw in the operating room together with a fourth which was reported in 1901. As a basis for this report I have reviewed most of the literature since 1846 and have gathered some rather interesting statistics regarding this most appalling complication. Most cases of rupture are probably incomplete at first, but not recognized until after the rupture of the peritoneum. The statistics of complete and incomplete rupture must be considered together if we would make a fair comparison.

FREQUENCY OF RUPTURE

The frequency of uterine rupture varies in different parts of the country being most common where the percentage of pelvic deformities is highest. In the Moscow Maternity there were 124 ruptures in 118,581 cases confined. Of these the rupture was known to be complete in 58 cases and incomplete in 43. In 23 cases the extent of the rupture was not determined. At the New York Lying-in Hospital there were 75 ruptures in a series of 60,000 cases. Of these, 46 were complete and 39 incomplete. It is impossible to secure accurate statistics regarding the frequency of this complication as in hospital practice we see the complicated cases of a large number of physicians and midwives without having any record of their normal confinements. On the other hand many cases undoubtedly occur which are not diagnosed the death being assigned to other causes. At the Moscow Maternity there was one rupture in 956 confinements, and at the New York Lying-in Hospital one rupture in 800 confinements. At the Royal Maternity Charity of London, from 1837 to 1856 Ramsbotham found records of only 8 complete ruptures in a total of 48,996 cases confined, or one in 6,124

cases. A few statistics given by others are as follows: Koblanck found 1 in 462 labors; Winckel, 1 in 666 labors; Brandl 1 in 1,200 labors; Jolly 1 in 3,403 labors; Harris 1 in 4,000 labors; and Lahmann 1 in 2,333 labors. The highest record we have found is from the Maternity of Bucarest, where there were 77 ruptures in a series of 23,016 cases or one rupture in every 400 cases. In these statistics the high frequency refers to both types of rupture, whereas the low reports refer only to complete ruptures. It is also worthy of note that the low records are from the earlier papers, written at a time when comparatively few cases were referred to the hospital.

ETIOLOGY

There are certain conditions which may be considered as predisposing to rupture. It is more common in multiparae. Brandl states that the proportion is 8 to 1. Trask reports 31 primiparae in 417 cases; Jolly 37 in 455 cases; Merz, 4 in 230 cases; Petréu 4 in 54 Swedish cases; and Cristeanu 4 in 77 cases at the Maternity of Bucarest.

We may briefly classify the predisposing causes as follows:

1. *Uterine*
 - (a) Retraction ring
 - (b) Prolonged or dry labors
 - (c) Cicatrices following Cesarean section, previous rupture or trauma.
 - (d) Placenta prævia.
 - (e) Degenerative changes in the musculature.
 - (f) Hydramnion
 - (g) High amputation of the cervix.
 - (h) Fixation operations
 - (i) Congenital hypoplasia of the uterus.
 - (j) Tumors of the uterus.
 - (k) Anomalies as "uterus duplex" and "uterus unicornis."
 - (l) Antelexion of the uterus, with diastasis.
 - (m) Congenital and acquired stenosis of the cervix.

- (n) *Hydatiform degeneration and thinning of the wall.*
- 2 *Fetal*
 - (a) Deformity of parts, as hydrocephalus or monstrosity
 - (b) Malpositions and malpresentations as transverse, face or brow
 - (c) Large foetus or twin pregnancy
 - (d) More frequent with male than female children
- 3 *Pelvic*
 - (a) Contracted or deformed pelvis.
 - (b) Obstruction of the pelvic canal by new growths or prolapsed organs.
- 4 *Vaginal*
 - (a) Stenosis, accidental or congenital.
 - (b) Incomplete septum and bands.
 - (c) Exceptionally tetanic contraction of the levator ani muscles.
- 5 *Intra-uterine manipulations*
 - (a) Manual or instrumental dilatation of the cervix.
 - (b) Instrumental deliveries—all types.
 - (c) Version
 - (d) Manual removal of placenta.

Spontaneous rupture is less common than the traumatic. Trask considered that it was spontaneous in at least 67 cases in his series of 417. Lobenzline reports 20 in his series of 46 cases. Spontaneous rupture is usually due to a diseased condition of the uterine wall or an extreme retraction of the upper uterine segment with corresponding thinning of the lower. Ivanoff made a histological examination of the uterus in 9 cases, studying the muscular elastic, and connective tissue. He was unable to explain the rupture on the basis of the histology although he found considerable variations in the percentage of elastic and connective tissue. Baurerstein has observed telangiectic changes in the lower uterine segment, and believes that careful histological studies will show this a more frequent condition than inflammation, sclerosis and fatty changes. He also noted the scarcity of elastic and connective tissue in the vicinity of the rupture.

TRAUMATIC RUPTURE

The uterus is particularly liable to injury during pregnancy owing to its size, position, and distended condition. It is subject to all

sorts of contusions and pressures, but there is usually little or no injury owing to the greater elasticity, mobility and the amniotic fluid which equalizes the pressure. Rupture has occurred from all sorts of trauma—a fall, a kick, goring by a bull and muscular exertion. Under muscular exertion we must consider all conditions which may cause a sudden contraction of the abdominal muscles, violently forcing the uterus against the vertebral column as sneezing, coughing, vomiting, or the lifting of heavy objects. Such ruptures may occur with an overdistended or diseased uterine wall. Overdistention may result from hydramnion, twin pregnancy, or an unusually large foetus. A diseased wall may result from carcinoma or other new growths, weakened Cesarean section scars, a former rupture or degenerative changes in the uterine muscle. The use of ergot in delayed labors has caused a number of ruptures.

Ergot was given previous to the rupture in 16 cases collected by Trask, and was, he thinks, responsible in at least 5 cases. Rupture however usually results from ill-advised or faulty manipulations. Any instrument used in delivering the child must be used advisedly and with great care. Undoubtedly unskillful use of instruments, manual procedures, and failure to recognize the dystocia are responsible for most ruptures. The danger of uterine rupture is in inverse ratio to the skill of the accoucheur.

Contracted or deformed pelvis were found in the following proportions:

Trask, at least	74 cases in 47 or 77 74%
Ames, at least	5 cases in 50, or 5%
Braxton, at least	9 cases in 3, or 66 2/3%
Mierz, at least	70 cases in 30, or 30 43 1/3%
Von Wubke, at least	cases in 7 of 64 7 1/4%
Frutkin, at least	348 cases in 500, or 77 6%
Lobenzline, at least	cases in 40, or 44 85 1/4%

Hydrocephalus was found by the various writers in the following proportions:

Trask, at least	cases in 47 or 87 2/3%
Ames, at least	6 cases in 50, or 6%
Braxton, at least	5 cases in 3, or 37 1/3%
Mierz, at least	8 cases in 30, or 7 1/3%
Ivanoff, at least	4 cases in 24, or 33 1/3%
Lobenzline, at least	cases in 78, or 45%
Cristobal, at least	4 cases in 77 or 5 0%

Ames quotes Keith as finding 6 cases of rupture in a series of 74 cases of hydrocephalus collected from the literature.

SITE OF RUPTURE.

In Trask's series 17 cases occurring during pregnancy involved the body and fundus, and 8 the cervix. Of the ruptures occurring during labor 110 involved the cervix, 17 the fundus and 71 the body of the uterus. Radford cited by Ames, in examining 19 cases found the location of the rupture to be longitudinal in 11 transverse in 3 oblique in 3 and circular in 2. Ames states that in his series it was posterior in 24 anterior in 15 on the right side in 13 and on the left in 9. Lobenstine in 26 vertical tears, found 18 on the left side 6 on the right, and 2 mesial. Sauvage cited by Lobenstine in a series of 36 complete ruptures found longitudinal tears 21 times and transverse 15 times. Franz reports 10 cases with 6 transverse tears of the anterior wall and one of the posterior 2 longitudinal lacerations of the cervix involving the body and one transverse of the vault of the vagina. Hinterstohser states that rupture from indirect trauma is more frequent than from direct, and that in these cases the uterus ruptures lengthwise in the anterior wall of the fundus. Two varieties of incomplete rupture are described rupture of the lateral wall into the folds of the broad ligament but not involving the peritoneum, and the so-called peritoneal fissures of Sanger which may occur in either the anterior or posterior wall.

We find that during pregnancy the rupture involved the body or fundus in 68 per cent and the cervix in 32 per cent of the cases collected by Trask. Of the cases occurring during labor 55.3 per cent involved the cervix 8.5 per cent the fundus and 36 per cent the body of the uterus. If we omit the vaginal vault case of Franz and include our 4 cases of which 3 were on the left side through the cervix and one involved the body and fundus we have 379 cases in which the site is mentioned. Of these 53.8 per cent involved the cervix and 46.2 per cent the body and fundus.

PREGNANCY AFTER RUPTURE.

There are many cases on record where the woman became pregnant after rupture. Trask includes 9 cases 3 of which had second rupture. Two of these women died the third

was saved by second laparotomy. Five women had one or more normal labors and in one case the result was not given. Wenzel reported a case where the woman had two miscarriages, at the seventh and sixth months, later carrying a child to term but dying from a spontaneous rupture through the old scar area. He also cited a case of D. W. Moore in which the woman had a rupture through the old cicatrix in a subsequent pregnancy and recovered. McLean delivered his case without accident one and a half years after the rupture. Wood reported a case in which the rupture was discovered 17 days after delivery. The gut was returned to the abdomen, the rupture repaired and subsequently the woman became pregnant. Kriwaki had a rupture in the sixth and the seventh pregnancies without obvious cause. Mikshine cites Battlehner as having three consecutive ruptures in one woman and Rose had four ruptures in one patient. In reviewing the literature he found 13 cases of second rupture and states that at least six of the women died. W. Stroganoff has followed two cases in which a complete uterine laceration was sutured. Both women became pregnant and were delivered without accident. He advises that these cases be kept under very close observation during the last two or three months of pregnancy and advocates delivery by version owing to the weakened uterine wall. The site of the former rupture should be palpated after delivery. We believe that Cesarean section or the use of forceps is safer than version in these cases. Version however is rarely given as the cause of rupture only two cases being recorded in Trask's series of 417.

RUPTURE AFTER CESAREAN SECTION.

Rupture of the uterus following Cesarean section was very common before the advent of modern surgery. Brodhead cites the fact that Kurkenberg in 1886 stated that after the old operation 50 per cent of all cases resulted in rupture of the uterus in subsequent pregnancies while on the other hand Ochshausen stated that they had only one scar rupture after at least 120 Cesarean sections performed according to the modern

methods. In the old days sepsis nearly always followed the operation and the muscular tissue about the scar became more or less degenerated. Harrar after reviewing the records of multiple section at the New York Lying-in Hospital says "Out of 30 instances of the multiple operation the old scar was either not found at all or when noted was solid in 42 four times it was attenuated in form twice there was partial rupture at the location of the old scar and twice complete rupture of the uterus. He made a microscopical examination of the tissue in three cases and found that the rupture took place through apparently healthy muscular tissue but located between two old section scars. Couvelaire states that the rupture occurs through an area of degenerated muscle along the edge of the scar. He considers that ruptures following section are due to anatomical condition of the scar overdistention of the uterus or the insertion of the placenta in the region of the cicatrix. The placenta was implanted upon the scar area in 5 or 6 cases in which the location is stated.

The probability of rupture following Cesarean section is not great and should not in the majority of cases be used as an argument in favor of sterilizing the women or performing the Porro operation. Section cases should be carefully watched during the latter months of subsequent pregnancies and in the cases where there is some pelvic deformity, overdistention of the uterus, or a question of the integrity of the old scar area Cesarean section should be performed several days before the expected onset of labor. The work of Harrar and other would indicate that it is best to remove the old scar. Should a patient go into labor on whom a Cesarean section was performed but in whom there are now no indications other than the history of a section she should never be allowed the trial of the second stage. The delivery should be by forceps or version if Cesarean section is not performed.

UNUSUAL CASES

Jewett reported a case where one of twin was born spontaneously while rupture occurred before delivery of the other. Reco-

ery followed hysterectomy. West and Watson have each reported a case of rupture in a bicornuate uterus. Albers-Schönberg reported a case where a kidney prolapsed into the pelvis caused the rupture. Larinsky reported a case where an ovarian cyst was responsible. Hypes had a case where the rupture was due to violent vomiting. Freed reported a case where rupture was due to hydramnion, occurring just after rupture of the membranes. Trask found a case where a fit of anger and the exertion accompanying it was responsible. Several cases are on record in which the uterus was ruptured by the horn of a bull. Coe reported 3 cases where the child is said to have weighed over 14 pounds.

FETAL MORTALITY

At the Moscow Maternity the fetal mortality in the entire series of incomplete and complete ruptures reached 87 per cent. In Lobenstine's series the fetal mortality was 83 per cent in 46 complete ruptures and 52 per cent in 29 incomplete ruptures. In reviewing the literature we find that when the child was saved the rupture was either small or occurred during delivery of the child or placenta.

SYMPTOMS AND PHYSICAL SIGNS

There is a great variation in the symptoms of rupture. When it occurs during pregnancy spontaneously or from external trauma, there is usually sudden and severe abdominal pain following some exertion or injury. But it may occur with the woman asleep in bed. The severe pain is usually followed by marked symptom of collapse. When rupture occurs during labor the patient may cry out in terror during a pain, that something has given away or broken. This may be accompanied by a tearing or snapping sound. She usually has exceedingly sharp gonizing pain in the region of the rupture. The pain may be colicky, burning, lancinating, or cramp-like. Uterine contractions soon cease a numbness or dull ache pervades the patient becomes pale and shows marked signs of shock. She has an anxious look, rapid feeble and often irregular pulse, increased respiration, and clammy skin. The temperature will

usually rise. The movements of the fetus are often violent just before its death. The heart tones disappear and the child can often be palpated free in the abdominal cavity while the uterus is firmly contracted at one side or in front. External bleeding may or may not take place. Death of the woman may occur in a short time but she may live a number of hours or days.

The abdomen is tender and often distended. It may be round due to the presence of amniotic fluid and blood or irregular in contour owing to the separate masses of uterus and fetus in cases where little fluid is present and the child has escaped into the abdominal cavity. Pain may render palpation very difficult. Fluid blood can rarely be detected by palpation or percussion.

A vaginal examination will show that the presenting part has receded or disappeared, the cervix is drawn up and only slightly dilated. The uterine cavity may be found empty or filled with intestines. The site of the rupture can be palpated. Catheterizing will usually give sufficient evidence to determine the presence or absence of a ruptured bladder.

There are cases on record where the symptoms of rupture were so slight as to be overlooked the condition being discovered accidentally while operating for Caesarean section. The symptoms are usually less marked in incomplete cases, hemorrhage frequently being the most severe symptom. Many cases are undoubtedly never diagnosed.

PROGNOSIS

The prognosis of uterine rupture depends on whether it is complete or incomplete, its location, whether treated in a hospital with its facilities or in the tenement, whether in the hands of a capable surgeon or a midwife and on the nature of the treatment. It is very serious for both mother and child. The prognosis is less favorable with complete than with incomplete ruptures. The lateral tears are most serious as they often involve the uterine artery. If rupture occurs in a hospital an early laparotomy should give a fair chance of recovery but when it occurs outside and the patient must be moved to a

hospital or treated under unfavorable circumstances, most cases are fatal if the rupture is complete. Laparotomies give the best chances of recovery in all classes of cases. Tamponade and binding should be employed only as temporary measures or where an operation is impossible.

Attention has been called by several writers to the danger of moving a patient in whom there is a threatened rupture or in whom the rupture has occurred. De Lee reports one case where the rupture is supposed to have occurred on the way to the hospital. This may have been the case in two of our patients but we have not sufficient evidence to make a definite statement in this regard.

DIAGNOSIS

The diagnosis is as a rule easy in the complete cases occurring during labor owing to the presence of a number of the above symptoms and physical signs. The vaginal examination usually establishes the diagnosis. It is more difficult to diagnose the incomplete cases and those occurring during pregnancy. Rupture with bleeding may be confused with placenta previa. Trask has included a few cases which were probably ectopic pregnancies. Webster warns us to bear in mind the complications which may exist with uterine rupture, i. e. prolapse and strangulation of the bowel, rupture of the bladder or rectum, escape of the liquor amnii with vernix caseosa and meconium into the peritoneal cavity and septic infection.

TREATMENT

The predisposing and exciting causes of uterine rupture should be kept in mind and prevented whenever possible. With a diagnosis of rupture there are three methods that have been followed in the past. A few cases have recovered with no treatment. The use of tamponade and binder is a method which may give fair result where the rupture is small or incomplete. But at the present time everyone is agreed that laparotomy gives the best results and we believe with C. Crutcher and Draghescu that it should be performed in every case as it is frequently impossible to tell otherwise whether the

rupture is complete. They advocate total abdominal hysterectomy and vaginal drainage for all complete cases.

Petrén in analyzing 754 cases, found that of 501 treated conservatively there were 361 deaths, or a mortality of 72 per cent while in 14 cases operated on there were 92 deaths, or a mortality of 53 per cent. He was presumably considering complete rupture of the uterus but has included the 124 cases from the Moscow Maternity 43 of which were known to be incomplete. Of the 347 uncomplicated cases reviewed by Klein, 149 were operated on with a mortality of 44 per cent 198 were treated conservatively with a mortality of 52 per cent. At the Moscow Maternity all of the cases were treated conservatively with tamponade and binding. In 23 cases, 3 of whom lived the extent of the rupture was not determined. There were 58 complete ruptures with a mortality of 88 per cent and 43 incomplete with a mortality of 62 per cent. After making a careful study of the literature and their own results, Ivanoff concluded that laparotomy gave twice as favorable results as the conservative methods.

CONCLUSIONS

The data presented in this paper can be briefly summarized as follows:

1. Rupture of the uterus is probably a more frequent complication of pregnancy than is indicated by the statistics of the earlier writers.

2. The difference between complete and incomplete rupture is one of degree. It is probable that most ruptures are at first incomplete.

3. As complete rupture increases the shock and danger from all hemorrhage and sepsis, it is the more dangerous complication.

4. The rupture involves the lower uterine segment and cervix in at least 53.8 per cent of cases, the rent being more often on the left side and frequently involving the uterine artery.

5. Certain ruptures may be prevented by close observation of the case during pregnancy and by good obstetrics.

6. A considerable number of ruptures follow Cesarean section. A woman who has had a Cesarean section should be confined in

a hospital in subsequent pregnancies, preferably by a section shortly before term, as we cannot know the condition of the scar area.

7. Tamponade and binder is a good temporary measure and may give good results in the incomplete cases where there is little hemorrhage but in all classes of cases operative treatment gives better results than conservative and should be employed when ever possible.

CASE 1 (previously reported by Dr Webster and Ella Davis). Mrs. S., Italian, aged 36, as admitted to the Presbyterian Hospital, Chicago at 4 A. M. December 1, 1900. The first pregnancy was terminated by forceps the next three were normal. In her fifth labor she was under the care of a midwife who diagnosed a free presentation and called a physician at A. M. He thought that everything was normal, and left. The woman had severe pains all day but made no progress. At 9 P. M. a second physician was called who attempted forceps delivery. A third physician attempted version, but failed. A fourth physician reached the case at

A. M. She found the woman having vigorous pains, but with weak, rapid pulse. Examination showed a face presentation, the chin posterior impacted at the brim of the pelvis. The patient as removed to the Presbyterian Hospital and Dr Webster called. His examination showed a deep tear extending from the perineum through the whole extent of the vaginal wall on the left side and this as continuous with a laceration which involved the cervix and the lower uterine segment. No fetus could be felt in the uterus. The abdomen was greatly distended the uterus being palpated as a firm, round mass bulging the lower portion of the abdominal wall anteriorly.

After administering saline solution, an abdominal section was performed. The fetus lay free in the abdominal cavity with quantity of fresh fluid blood. The uterine laceration involved the cervix, the lower uterine segment and a small portion of the upper uterine segment on the left side. The posterior layer of the left broad ligament as entirely torn away, the rest being continuous with deep tear which involved the vaginal wall. The fetus and uterus were removed as quickly as possible the pelvic cavity being packed with gauze which was carried to the apex. The patient rallied for a time but died 6 hours after the operation as result of hemorrhage and shock. The fetus as male, weighing little over pounds and as 55 cm. long.

CASE 2. Mrs. B. aged 37, third pregnancy admitted to the Presbyterian Hospital May 26, 1901 at 8.30 A. M. Dr Webster terminated her first pregnancy by Cesarean section owing to a severe albuminuria, and D. Holmes delivered her second child with forceps. She came to the hospital alone and in condition of marked toxemia. She as

uncertain as to her name and address. It was impossible to secure any history of her former labors or this pregnancy. Her face was puff and there was marked edema of the feet and legs. A catheterized specimen of urine contained a large amount of albumin and a considerable number of pus cells, but no casts. Owing to the extreme toxemia the Rhesus bag was introduced. She began to have severe labor pains. Four hours later as the pains were becoming tetanic in nature she was taken to the operating room, the bag removed and the cervix manually dilated under anesthetic. The examination at this time showed shoulder presenting, with the head on the left side. A dead fetus of average size was delivered by version. When Dr. Culbertson introduced his hand to perform the version he palpated fibrous bands. The patient died just after the delivery. The fetus was not macerated, but had probably been dead for some hours as the heart tones were not heard at any time.

Autopsy. The body is that of a well nourished woman. There is a marked edema of the feet and legs. On opening the abdomen the uterus is seen with a large irregular tear extending along the border of an old scar for a distance of 11 cm. and from the fundal end of the scar toward the left to be and coming within 1 cm. of it. The placenta is separated and lies in the torn area. A small amount of blood is seen in the peritoneal cavity. The liver is enlarged and shows fatty changes. The left kidney is larger than normal and on cut section shows evidence of chronic inflammatory changes. The right kidney is more pus sac. Anatomical diagnosis: rupture of the uterus, chronic interstitial nephritis, pyelonephritis of right kidney and fatty degeneration of the liver.

We believe that this patient died from the extreme toxemia and the degenerative changes resulting rather than from rupture of the uterus. The anesthetic shock probably hastened death. In this case the toxemia masked all the symptoms of threatened rupture. When asked regarding the abdominal pain she would only say "Operation," and the pelvic measurements or normal a former Cesarean section as not suspected. However, section performed soon after her admission to the hospital could not have saved her and the fetus as already dead. This case shows the necessity of following cases throughout pregnancy.

(Case 3) Mrs. D. aged 35 second pregnancy normal delivery the first as admitted to the Presbyterian Hospital in week November 1901. In this labor her physician in consultation with another attempted to deliver the fetus after which she died in the second stage of labor. Several hours had begun to show signs of exhaustion. As soon as the rupture was diagnosed she was placed on the table brought some twenty miles to Chicago. On admission to the hospital she was taken to the operating room, severe shock and quickly prepared for operation. C. hysterization showed that the bladder was also ruptured. The

abdomen was opened under local anesthetic, by Dr. Webster and after clamping the uterine artery 1,000 cc. of saline was given intravenously. The abdominal cavity was filled with clots and bright red blood. A hydrocephalic, spinabifidous fetus lay free in the abdominal cavity. Urine, vernix caseosa, and meconium were mixed with the blood. A complete rupture of the uterus, 6 inches long, was found on the left side along the uterine artery which was torn and bleeding. A rupture 2 inches long was found on the posterior surface of the bladder. The uterus was extirpated and the tear in the bladder repaired. The patient died from loss of blood and shock just after the closure of the abdomen.

CASE 4. Mrs. W. aged 36 sixth pregnancy first five were prolonged but normal in other respects. After the fourth pregnancy she was in Michael Reese Hospital for repair of the cervix and perineum. The fifth child, an 8-pound boy was delivered by the out-patient department of the hospital after a labor lasting 36 1/2 hours. The preliminary history made November 30, 1908, states that the perineum was relaxed from old lacerations and the cervix gaping but showing evidence of repair. No new laceration was reported in the fifth pregnancy.

The patient began to have pains October 9, 1912, and after the escape of some water went to Michael Reese Hospital. Her pains stopped and she returned home the next day. October 12 she was at the Central Free Dispensary where she stated that the pains were not severe and came every half hour. The abdominal examination was made. Uterus small apparently present O. L. A. position, foetal heart tones, 30 per minute. As she gave a history of prolonged labors and seemed to be in good condition she was sent home and told to call the hospital when her pains became more severe. An interne called at her home the next day and reported her as having slight irregular pains. She began to have severe labor pains October 15 and called for a doctor 1:30 A. M. The interne resided at her home about 8 A. M. Her condition did not seem good; pulse was rapid, pains very severe and frequent, foetal heart tones 90. A vaginal examination disclosed a tear on the left side of the cervix about one inch long, poor effacement and only moderate dilatation.

Considerable time was lost in persuading her to come to the hospital. She was admitted shortly after 4 A. M. and was seen little later by Dr. Heaney who diagnosed rupture of the uterus and ordered her to the operating room. Dr. Webster opened the abdomen under local anesthetic but she died before the anesthetic could be given. The body of the child had escaped through a rent which extended along the left uterine artery from the cervix to the corpus, but the head was found engaged in the O. L. A. position. The placenta had not escaped. The pelvic measurements were practically normal. The child head as average in size and it weighed about 8 pounds.

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ABDOMINAL PREGNANCY WITH A LIVING CHILD

B. J. SHELTON MORSELEY M. D. RICHARD VILSON

THE statistics of abdominal or extra uterine pregnancy with a living child have been brought down to 1897 by Howard A. Kelly and Edward A.

Ayres. Kelly's statistics comprise 77 cases with viable foetuses delivered by laparotomy from November 1809, to November 7. 1896. Ayres brings the tables through 897 and adds 14 cases not included in Kelly's table. This makes 91 cases. From 897 to January 1. 1912 there have been 12 cases added and one in 1897 evidently overlooked making a total of 104 to 912. In order to make the literature accessible I will give brief abstracts of these 13 cases.

Case Crouzet and Jeannel. The patient was delivered of a well formed male child who lived 4 hours after the operation. The pregnancy had lasted about eight months

The placenta was not removed. The mother died from infection in the placenta one month later.

Case 2. J. B. Sutton. The patient went to full term, and on operation the child was found alive having escaped from the amnion, and was disporting among the intestines. The placenta was removed without difficulty. The child died from convulsions soon after delivery. The mother recovered.

Case 3. H. Tubohake. The child was well developed and living when report was made. Placenta attached to liver and was not removed. Mother died 32 hours after delivery.

Case 4. W. L. Estes. The pregnancy was at full term. The child was delivered living and was healthy at the time the report was made. The placenta could not be re-

moved on account of hemorrhage. A marsupial operation was done. The mother died from infection thirteen days after the operation.

Case 5 H. W. Freund.¹ A full-term pregnancy. The child died six hours after delivery. The placenta was not removed on account of hemorrhage. The mother recovered.

Case 6 Fournier The pregnancy had lasted about seven months. A well formed child was delivered and lived half an hour. The placenta was removed after considerable haemorrhage. The mother recovered.

Case 7 A Sittner² A full term preg-
nancy The child was living when the re-
port was made. The mother recovered.

Case 8 E T Hargrave A full term pregnancy The placenta was removed The child lived one hour The mother recovered

Case 9. Duff G. Lewis. An eight-and-a-half months pregnancy. The placenta was not removed. A deformed child was delivered and lived three days. The mother recovered.

Case 10 J A Allwood An eight months pregnancy. The placenta was removed. The child lived three hours. The mother recovered.

Case 11 Weiss. A full-term pregnancy. The placenta was removed. The mother and child both recovered.

Case 12 Gen. V Lockett. A full term pregnancy. The placenta was removed. The child was normal and living 30 months after delivery. The mother recovered.

Case 13 John W Lake A full term pregnancy The child lived 24 hours The mother recovered

On the total number of 104 cases, there were 49 maternal deaths. A large proportion of the mortality occurred before the anti-septic era. In Kelly's table only two

of the first twenty mothers were saved. In the thirteen cases collected from 1897 to 1912 there were three deaths. The recovery of the child however has not been materially affected by a septic surgery. The mortality of the child has been a relative thing, because this list only includes children that were delivered living. The vast majority of them lived only a few hours, or at most a few days. Some of them were deformed. A few however survived. Probably a successful case can be gauged by the recovery of the mother and by the fact that a healthy child was delivered and was alive and well twelve months after the operation. From the cases where there are sufficient data given we can select five that correspond to the requirements of saving the mother and the child living at least twelve months. There are undoubtedly several others that should be added to this list, but when reports are published giving details of such cases it is merely stated that the child is alive at the time the article was written. It is not entirely accurate to include such cases, for the article may have been written some time before publication.

I wish to add a case of my own to the list of abdominal pregnancies with a living child which makes a total of 105 cases on record. In this instance both the mother and child recovered, and the child was living and well on December 17 1912 more than a year after the operation. The history of the case is as follows:

H L colored, aged 7 years, from Brunswick
 Co. ty Virginia, was referred by Dr B W Dam-
 croon. Family history of no importance. The pa-
 tient had been married ten years and had men-
 struated regularly except when pregnant. The first
 pregnancy resulted in miscarriage at four months
 about one year ago. The next child was born dead
 a full term year before admission to the hospital.
 The first menstruation missed since these pregnan-
 cies was in March. There was some slight bleed-
 ing in April and May but since that time there had
 been no sign of menstruation. There were no pains
 in the abdomen until the onset of labor and the pa-
 tient had no reason to believe that the pregnancy
 was abnormal until labor began. On the first of
 December she had cramp-like pains around the
 navel, which were very severe. There was no pain
 in the back. The feet were slightly swollen. These
 pains continued and Dr Damcroon was called in.

He found the uterus empty diagnosed abdominal pregnancy and brought the patient to the hospital. She was admitted to Memorial Hospital on December 3, 1901 and referred to the obstetricians of the hospital, Doctors D. J. Coleman and M. L. Anderson, who confirmed Dr. Dameron's diagnosis and referred the patient to me for operation. When I saw her on the evening of December 31st, she was much exhausted by pains with legs swollen and pulse 140. She was apparently at full term. A special clinic of senior students was called, and operation performed at 10 o'clock at night on December 13, 1902.

A long incision was made a little to the left of the middle line. The intestines and omentum tended to protrude. The anesthetic was given lightly as the patient's condition was considered dangerous and she was not thoroughly relaxed. After packing away the intestines and omentum, the baby was found lying largely to the left of the middle line and floating among the intestines, covered only by a thin membrane, which also surrounded the placenta. In order to save the child the delivery was accomplished as rapidly as possible. The head was towards the pelvis and was lifted up with the hand, at the same time rupturing the membrane. The cord was clamped and the child was given to Dr. M. L. Anderson for resuscitation. The baby was a boy weighing six pounds and had no deformity. There were few adhesions of the intestines and omentum to the sac; these were separated and ligated where they were vascular. The placenta and the sac had a distinct pedicle from the left broad ligament. The pedicle was ligated and the placenta and membranes were removed. The con-

dition resembled very much an ovarian tumor in which the child and placenta might be said to constitute the contents of the tumor. The sac was closed in layers with catgut, and as there was some bloody fluid present, drainage tube was placed in the cul-de-sac through stab wound in the right flank.

The patient was returned to bed, with pulse of 50. She was given saline subcutaneously and one or two doses of strychnine and apertine. Her pulse gradually improved and she soon entered upon convalescence, with temperature around 100, and pulse from 95 to 105. On December 24th, nine days after operation, she began to have more elevation of temperature, with pain in the right side directly over the point where the drainage had been placed at the time of operation. There was a mass and local rigidity. Blood count showed moderate leucocytosis. She was given hot douches and supportive treatment. These symptoms continuing and vaginal examination showing mass in the cul-de-sac, posterior vaginal section was done on January 9, 1903. Pus was discovered, but there was free oozing of blood. A rubber tube was fastened in the opening. From this time on her convalescence was satisfactory. There was slight stitch infection of the abdominal wall, which healed readily. Mother and child were in excellent condition when discharged from the hospital on January 21, 1903, and both are well now December 7, 1903, more than a year after the operation.

NOTE.—Mother and baby were shown before the Southern Surgical & Gynecological Association on December 8, 1903. They were both in good health.

PERICOLIC MEMBRANE OF THE BROAD LIGAMENT

By ARTHUR E. HERTZLER, M. D. KANSAS CITY, MISSOURI

MUCH has been written on the pathogenesis of the "pericolic membrane" in various parts of the body other than the colon, but so far as I know it has not been described on the broad ligament. I have observed it here for some years past in operations for varicocele of the pampiniform plexus. Inasmuch as the membrane in the various situations is due to like causes, its occurrence on the broad ligament is well worthy of study.

The condition is best presented by the discussion of a concrete case. A patient 3 para, one abortion 6 months ago, presented a laceration of the perineum, a moderate rectocele and

a pronounced cystocele. The cervix was just within the introitus. The fundus was large and retroverted. When the uterus was lifted up through an abdominal incision and the broad ligament was raised upon the finger the following was noted: the veins forming the pampiniform plexus were large and their walls markedly thickened. They ran more or less parallel and were directed laterally from the uterus. Over these the peritoneum as usual could be freely moved. Within the substance of the peritoneum were numerous vessels, which formed a network although the prevailing direction was from below upward toward the tubal mesentery. They were

about the size of a number one catgut or larger. They could be depleted by pressure and readily refilled when pressure was removed. The peritoneum was incised and lifted from the varicosed pampiniform veins. When this was done the plexus of vessels above described was lifted with it. Except where the dilated veins lay the peritoneum showed its usual transparent appearance. By very careful dissection anastomosis between the plexus of the peritoneum and the pampiniform veins could be made out. These caused a slight temporary oozing when the peritoneum was raised up. The pampiniform veins were doubly ligated and divided and the incision into the peritoneum was closed with Lembert sutures. With the removal of the dilated pampiniform veins the vascular plexus became less marked not only immediately about the incision but also in regions where the peritoneum was not loosened.

I had an opportunity some years ago to observe the late effect of pampiniform resection on the dilated plexus in the peritoneum. A patient having a condition in the broad ligament similar to that described above was operated upon for an interstitial fibroid which was treated by bloodless hysterotomy with ligation of the broad ligament veins. I had occasion a year later to reoperate this patient for the purpose of doing an ileo-sigmoidostomy. The broad ligaments were examined and the peritoneal plexus of veins previously noted was not visible.

I have frequently produced this condition experimentally. The mesentery in animals is as transparent as the cornea except where the arterie intestinalis tenuis and their accompanying ens course. These clear spaces when treated with silver nitrate show fine plexuses of elongated endothelial cells. If any irritation is produced causing dilatation of the vessels normally visible a capillary network becomes apparent in the area previously transparent. It is a mistake to assume that the process here is similar to that which occurs when vessels appear in the cornea as a result of irritation. In this structure there are no preformed vessels and when they appear from some irritation they arise by a proc-

ess of budding as so often described by the pathologists several generations ago. In the peritoneum these vessels already exist, though blood does not normally flow through them but when an increased blood flow to the part is demanded by some reactive process or forced by stasis, they dilate and become the avenues of a collateral circulation or the receptacle of excess blood.¹

That the condition of which the pericolic membrane is a special case is dependent upon fundamental principles in pathology (or shall we say adaptive physiology?) and not upon the inherent character of the peritoneum and its vessels is shown by the fact that conditions exactly analogous to those detailed for the broad ligament are seen in varicocele of the pampiniform plexus in the scrotum. I have seen it most marked as one might predict in severe cases of long standing. Here if one will take the time to expose freely the structures in question and isolate the veins with care one will see large veins outside of the pampiniform veins. I have seen these accessory veins, which normally are not visible to the naked eye, as large as a goose quill though, unlike the vessels in the peritoneum, they do contain blood. These vessels when dilated as above described are readily seen through the skin and in fact do lie in the deeper layers of that structure and in the deeper tissues of the scrotum. I have noted for some years this association of dilated superficial veins with varicocele of the pampiniform plexus and it may confidently be stated that persons of mature years with unrelieved congestion of the deep veins will possess pericolic membranes in the region indicated.

The importance of these observations lies in the fact that they indicate that the changes in the peritoneum are problems in the pathology of the circulation. In a paper published some years ago I called the condition above referred to varicosities of the peritoneum.

These important but normally invisible channels are best demonstrated by injecting pure castor oil under moderate pressure into the peritoneal cavity without opening the abdomen. The injection should be made as times as possible. Small-pore cannulae are most easily injected. Fifty cc. of solution may be injected into small-pore cannulae. After the injection is completed the abdomen is opened and sections of mesentery and mesocolon are taken out for microscopic study. The normally transparent and bloodless spaces are seen to be traversed by a fine capillary network which the silver readily follows but which contains no blood under ordinary conditions.

For some cases that is the only term which describes the pathological changes present. In other cases *hyperemia of the peritoneum* would be a better term. In temporary conditions it is the only term applicable. In the more chronic conditions where there are the same changes in the vessel walls as one finds in varicosities of the legs and in the pumpkin form plexus the term originally employed by me is warranted. The hyperemias fall naturally into several classes. The condition described above in the broad ligament is of course a simple passive hyperemia. In the more acute cases as seen about a subacute appendicitis it is in its inception active in that it is brought about by the demands of the reactive process. The vessels may contract and disappear when the focal lesion which called them forth disappears. On the other hand when the dilatation is kept up for a sufficient length of time the vessels lose their power to contract and they remain permanently dilated, whether the initial lesion recovers or not. In the end stage it may be difficult to determine the history of a particular case and a study of associated conditions only leads to the true explanation. In the case detailed above, in the broad ligament it is safe to say that the peritoneal veins were the result of a passive congestion. If the frimbriated extremities of the tubes were sealed and there were adhesions about the tubes and ovaries and there was an absence of factors causing passive congestion such as old lacérations and displacements, it would be fair to assume that there was a primarily active dilatation which failed to contract after the relative recovery of the tubes.

The problem is one of pathology of the circulatory system and a study of Hunter and Thoma sheds more light upon it than the study of modern literature. The fundamental fallacy in clinical speculation is that surgeons have assumed that some grave crisis must have existed to bring about such results. A study of the pathology of the structures in question makes it clear that such is not the case. Dilated vessels in the legs and of the scrotum are not preceded by grave clinical disasters. In the peritoneum too slighter

lesions are the ones that are followed by the dilatation whether active or passive. Grave disasters are not the ones which are attended by the development of these vessels as the instances quoted above.

Recently an attempt has been made to ascribe the condition to developmental anomalies. Unusual folds or an unusual development of normal folds may of course be the site of the development of these vessels but they cannot be the cause since they present nothing that could produce changes in the circulation. Perivascular changes resulting from stasis may cause normal folds to appear more prominent but to consider them a result of such folds would be quite as reasonable as to ascribe varicosities of the legs to the *ordema* present.

Here as elsewhere it is illuminating to study the structure of the lesion present and to inquire if like lesions occur in other parts of the body. Whenever a lesion is discovered the genesis of which is in doubt the production of a similar lesion in the lower animals often sheds light upon the process. The lesions in the peritoneum above noted can be limited in lower animals in altes where congenital anomalies do not come into question. A bit of sterile gauze thrust under the peritoneum will be followed by a typical pericolic membrane in the course of weeks or months.

The only congenital factor that comes into play are those inherent in the vascular system. Individuals with lax scrotums and long bellies or women with their pelvic organs at the introitus and their intestines in their pelvis are very apt to have pericolic membranes. That individuals perfectly normal may develop these vessels is well known and is substantiated by their development experimentally in the lower animals. The fact remains that they are more prone to development in persons with a general laxity of the fibrous tissue in general and of the vessels in particular.

I have purposely avoided any reference to pseudo-peritoneal membrane. These are new formations the result of exudative processes. These pseudo-membranes have been confused with pericolic membranes but this is unwarranted since their genesis is entirely different.

LENGTHENING SHORTENED BONES OF THE LEG BY OPERATION¹

IVORY SCREWS WITH REMOVABLE HEADS AS A MEANS OF HOLDING THE TWO BONE FRAGMENTS

BY PAUL B. MAGNUSON, M. D., CHICAGO

From the Laboratory of Experimental Surgery, University of Pennsylvania

THE possibilities of an operation for lengthening the long bones especially those of the lower limbs, obviously depend on two things. First, the number of cases in which such an operation would be of decided benefit; second, the perfection of the technique of such an operation so that its danger should be reduced to a minimum. The first of these conditions exists as a result of anterior poliomyelitis in childhood preventing the full development of one lower limb, shortening after fracture or in cases where injury to an epiphysis has taken place before maturity is reached. The first is by far the most common, and would seem particularly adapted to this treatment since certain groups of muscles are atrophied and there is less muscular force to overcome. According to Dr. de Forest Willard, the repair of bones affected by this disease is not retarded. The second class should be easily handled for it would be merely a restoration of the tissues to their recently lost normal length. The third class, due to injury of the epiphysis, would be the most difficult, but it should be operable if the technique described later is as successful in operating upon the human as it has been in our experiments.

It was to prove that the technique could be made simple and the risk of such an operation be made small that this experimental work was attempted. The first problem was to find a method of cutting the bone and holding the two fragments in extension. The procedure used by Hopkins and Penrose (1) in 1889 hardly conforms to our present ideas of inducing regeneration. They cut the bone transversely, extended it and into the ends of the medullary cavity inserted a bone peg which was held in place by transverse pegs. This blocked the ends of the medullary cavity and left no periosteum over the space between

the fragments, making it impossible for new bone to be formed in the interspace. The plan adopted in our work was to make a medial longitudinal incision in the bone and join it to the periphery with transverse incisions approaching the opposite ends from opposite sides (Fig. 1). In this way the bone could be kept in line; it gave a better chance to fasten both the fragments, and did not destroy the periosteum nor injure the endosteum and the bone would be as strong and straight as before the operation.

The next requirement was to devise some method of holding the two fragments in perfect apposition without allowing the slightest movement. It is not necessary to go into the details and failures of the different methods which were tried. Suffice it to say that silver wire would not hold against the steady pull of the muscles on the fragments unless twisted very tightly and when this was accomplished the pressure caused necrosis of the surrounding bone, loosening of the wire and finally its discharge through a sinus. Silver screws would hold the fragments, but also tended to produce softening of surrounding bone, letting the fragments slip back and they had the disadvantage of a head protruding beyond the cortex of the bone, offering increased pressure to the soft parts.

Ivory pegs were next tried, but the callus growing from the medullary cavity separated the ends of the bone in less than three weeks. Ivory screws were then put on trial but the first ones were made with fine threads which invariably broke off in the process of driving in. The experiments finally resulted in the use of ivory screw with deep V-shaped thread and removable brass heads, to which enough force could be applied to drive the screw in solidly (Fig. 2A).



Fig. 2

TECHNIQUE OF OPERATION

The technique followed was an incision through the soft parts over the inside of the tibia down to the bone the periosteum was dissected away in a median longitudinal line about three inches long and wide enough to accommodate a circular saw with which the incision was made through the bone (Fig. 3A). A great deal of care must be taken in starting this cut, for a slip sideways would destroy a considerable amount of periosteum. The

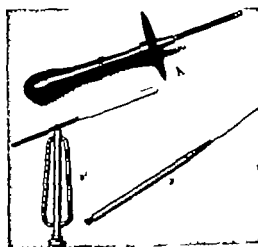


Fig. 3

fibula was then stripped off the under surface of the tibia and broken with a small osteotome, which was slipped in between the bones. The fibula is a very rudimentary structure in the dog and is attached to the tibia by fibrous tissue. The cross incisions were then made with a blunt pointed keyhole saw (Fig. 3B) and the few remaining small bridges of bone connecting the fragments were cut with an osteotome. In operating on the human I use a circular saw (Fig. 3A) with handle at both sides, and instead of an osteotome which is rather thick I use a carving chisel with very thin blade (Fig. 3C) as copied after Murphy.

To put weight on the fragments and drag them apart, hooks were used. These were caught in the angle made by the junction of the longitudinal and transverse incisions. The upper one was fastened to the head of the table and the lower one attached to weights by a wire run over a pulley at the foot of the table. Thirty two pounds were used in all cases and one fourth to one-half an inch of lengthening accomplished in from three to five minutes. Applying the extension in this way the force is all exerted on the muscles attached to the two parts of the bone. The joints and soft parts above and below are saved from strain and the stretching is accomplished more quickly. When the desired amount of extension was reached, a plug was

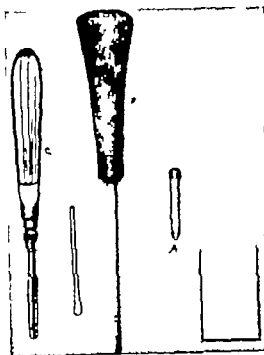


Fig. 4



Fig. 4

put between the ends of the fragments and the weights removed. After putting the fragments in perfect line, the holes nine sizes (screw gauge) smaller than the screws were drilled about half an inch from the end of each fragment. A tap (Fig 2c) with thread the same size as the screw to be used, was put through to cut a thread in the bone then the screw was inserted and both ends cut off flush with the shaft, leaving nothing projecting beyond the cortex. The interspaces were allowed to fill with blood and the wound closed with silk sutures, and dry dressings applied.

REASONS FOR USING IVORY SCREWS AND THE ACTION OF THE TISSUES ON IVORY

While the lengthening of bones was the original problem, the ivory screws developed in the course of experimentation seemed to give promise of value as a practical means of holding bone fragments in other operations. Ivory is strong enough to withstand muscular action exerted on the broken bone. It will not loosen or slough out, and when the operation is complete all projecting ends are cut

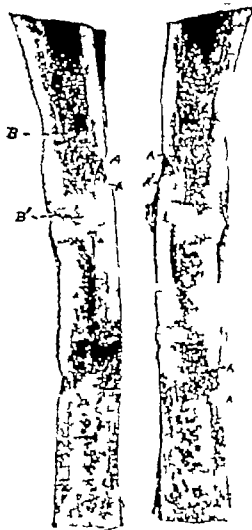


Fig. 5

off leaving nothing to injure or irritate the soft parts. Subsequently the ivory is absorbed leaving the healed bone as solid as before injury.

There is a great diversity of opinion in literature regarding the absorption of ivory which seems to have arisen from two causes which are (1) that ivory will not be absorbed unless very closely surrounded by living healthy bone (2) that if any suppuration is present erosion does not take place.

In these experiments it was impossible to even find the location of the screws in two



Fig. 1

three month specimen was completely without the ivory destroyed and in no case was an erosion noted if there was a suppurative process in the bone.

A microscopic study of the process of absorption showed in a four week specimen the screw unchanged in close contact with the cortex but that portions which lay in the medullary cavity was much eroded (Fig. 4). The threads were taken away and new bony lamellae lay in very intimate contact with the ivory. In some places osteoclasts were between the two substances and osteoblasts were much in evidence but in numerous areas trabeculae of new bone lay in close apposition to the eroded screw with no cell or any character intervening. This suggested a possible chemical or digestive destruction as well as mechanical break off of fragments.

STATISTICS

The statistics of sixteen operations on dogs are as follows:

In the first ten operations, here every pup was saved, after growing from the ends of the medullary

cavities portions of the femoral parts, but not of the humeri, glenoid, or of the lower extremities. Three dogs died of infection, one died of sepsis, the others died of fracture. The femoral fracture healed after four weeks of subsequent healing. Three were lost because of infection. It may be proper to mention that the first test was performed at a distance of one meter from the fragment there. The first four dogs were free from the metal fragments. Four dogs fractured their legs after operation. Of these three are compound, and the dogs are killed. One united with a good deformity. Four percent of successful bone union was the fracture of the femur and the humerus.

These figures do not in any way seem to be encouraging but for any one who is not impossible of immobilizing the dog, having the difficulty of immobilizing the dog and finally that the technique of all dogs helped by the others than of most has not all of its references to previous work done on the legs but at first do not the least show the

A four week old specimen studied grossly showed the bone firmly united to the long and short marrow the line of union being barely noticeable. The



Fig. 8.

Interspaces contained a hard, bony substance almost completely filling them which could not be broken away (Fig. 5). A thick layer of periosteum had grown over this substance and was adherent to it. On longitudinal section the medullary cavity opposite the interspace, and for about three-eighths of an inch on each side was seen to be filled with hard compact calcareous substance which appeared to be flowing into the interspaces. The screws were intact for the most part, only here and there threads were eroded, the bone cells having protruded themselves into the eroded area as the ivory was carried away leaving the substances still in close contact.

MICROSCOPIC REPAIR OF REPAIR

Microscopically it was seen that repair was taking place both from the endosteum and periosteum. The periosteum had grown over the interspace and was in close contact with the new bone which had grown up into the space from the medullary cavity. Both structures had a rich blood supply and appeared to be working in unison towards one goal, the filling up of the interspace with new bone.

PRACTICAL APPLICATION

To consider the operation from a practical standpoint the anatomy of the parts to which it would be applied should be reviewed. The femur is obviously the most suitable location for operation. With the exception of the sartorius and gracilis, the tendons of the muscles which run from the pelvis to the knee are easily accessible and tenotomies can be done. The other muscles originating on the pelvis are attached to the upper half of the femur except the adductors, which are inserted along the inner side down to the knee. The muscles originating on the femur and attached to the lower leg are located, for the most part, on the lower half of the femur on the anterior and external surface. Only comparatively few fibers extend beyond these



Fig. 9.

lines. Taking advantage of these anatomical facts a longitudinal incision should be started at the middle of the femur between the adductors and the vastus internus and extended down to the point at which the femur becomes larger in circumference to form the condyles. The longitudinal incision through the bone, considering the femur as a cylinder would be at an angle of about thirty degrees, with the antero-posterior diameter and in the long axis of the bone. The lower transverse incision will be made then on the internal surface and the upper one on the external surface so that all the muscles on the upper fragment are attached to the pelvis and nearly all those on the lower fragment to the leg, reducing to a minimum the amount of muscular resistance to be overcome. There has been some criticism of this operation on the grounds that the blood vessels and nerves would not stand the stretching process to any degree. I have however one case of a boy fourteen years old, with a subtrochanteric fracture of the left femur with two inches and a half of shortening (Fig. 7).



Fig. 7

This boy came to me four months after the injury reporting that while he was running upstairs he fell striking his left hip on the edge of a step. A doctor was called in and diagnosed a dislocation of the hip. He manipulated the leg, put the boy in bed without any apparatus, kept him there for about a week, and then allowed him to get up and walk around on crutches. The result was shortening of the leg, overriding of the fragments, shortening of two inches and half an inch in the foot, and a large amount of callus at the seat of fracture. It was between four and five months after the injury that the boy first came to me and about a week after that he was sent to Wesley Hospital for operation.

On making a lateral incision over the seat of fracture I found that the upper fragment had been rotated posteriorly and abducted and that the lower fragment was pulled up so that the upper end lay in front of and very close to the neck of the femur. A firm bony union had taken place between these fragments, filling in a V-shaped space with compact callus. My first procedure was to drive a thin-bladed curving chisel up between the fragments, separating them on the side. I then found that the callus extended round posteriorly and with Lane forceps rotating the lower fragment inward and another forceps on the upper fragment rotating outward the chisel as drive down through the callus and liberated the fragment. After this was done (Clover hitch of bed-ticking having been put around



Fig. 8

the knee previous to the beginning of the operation,

with a pad in the perineum and counter extension applied by tying a strip of ticking to the head of the table) rope was attached to the strip around the knee and run over pulley extended from the foot of the table and splunked by a standard on the floor (Fig. 8). To the end of this rope sixty-five pounds of window weights were attached and the soft parts stretched down, so that the end of the fragments could be accurately apposed without any manipulation inside the wound except to guide the fragments with a lever. After the stretching process, Lane plate was applied and the wound closed with catgut and silk on a gut without drainage (Fig. 9). A single splint of the hip and leg was applied, and the boy put in bed. This is where I believe that mistake was made since I did not put extension on his limb after the boy was put in bed. There was some slight angulation at the seat of fracture, and *coxa vara* resulted, which still persists (Fig. 10). The boy expects to go to the hospital again the next month, at which time I do subtrochanteric osteotomy thus correcting the *coxa vara*. This should not have been necessary if I had realized in the first place that a splint of the hip could not hold the fracture solidly enough against the pull of the muscles. The plate was removed from this case about eight weeks on account of persistent discharge of sero-pus, although the boy was not running yet. After the plate was removed the



Fig. 2.

ound promptly healed and although the patient has had many falls in playing first base on baseball team all summer he claimed to have had no pain in the hip and no disability. The coxa vara is not getting any worse but it is not a perfect result.

This case would indicate to me that we at least can get two and a half inches of lengthening in a femur without interference with the blood and nerve supply.

D. S. C. Plummer had a case about a year and half ago of a pitcher about forty-two years old who had three inches of overriding of the fragments in a fracture of the femur six months old, in which the fragments were firmly united by callus. He stretched the muscles, nerves and blood vessels in this case by the same method used in the case just referred to and brought the ends of the fragments into accurate apposition the stretching process lasting between fifteen and twenty minutes.

I am sorry I am not able to show this case since he died of acute alcoholism some time after the operation. He lived long enough, however to determine that there was no

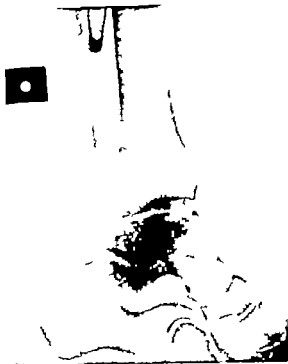


Fig. 3.

interference with the blood or nerve supply in the operated limb.

I have a case of recent fracture in a man, thirty years old, which was spiral in shape, very oblique and included part of the greater and lesser trochanters in each fragment, with one inch and a quarter of shortening. I stretched this fracture down into place in five minutes with seventy pounds of weight ten days after the injury and inserted one ivory screw through the fragments, which was all the retention apparatus that was needed in this case. However I kept extension on this man for two weeks after the operation, having learned lesson to dear price from the first case reported. This man went home at the end of seven weeks with a perfect result (Figs. 4 and 5).

One more case in which ivory screws were used in retaining fracture. J. M. aged fifty-two fell from the top of a freight car sustaining a fracture of the fibula and fracture of the internal malleolus of the left leg (Fig. 3). We were not able to reduce the fracture satisfactorily under a narcotic and an open operation was made. In this case the oblique fracture of the fibula was held in place with a single ivory screw. Tenotomy of the tendo-Achilles was done to prevent any posterior dislocation of the foot, and the case put up in plaster (Figs. 4 and 5). In this case as well as in the one just previously reported, the wound healed by first in-



Fig. 4



Fig. 5

tion, there was no discharge of serum, there never was any pain, and by palpation cannot determine that there was ever any retention of the appliance inserted in these bones.

CONCLUSIONS

1. A shortened femur may be lengthened from two to three inches without any interference with blood and nerve supply excepting in cases where there is a large amount of old inflammatory tissue which would limit the stretching of the blood vessels and nerves, or which might produce kinking.

2. Ivory being an animal matter is entirely absorbed by the tissues, does not act as a foreign body in bone does not cause necrosis or slough out as do most other materials.

3. Ivory screws may be cut off flush with the shaft of the bone leaving nothing to project into or irritate the soft parts.

4. There is no flange or shoulder on the screw to prevent it from entering to its full length. The method of application insures the screw fitting accurately into the hole

made for it since a tap is put through first, the deep thread into the bone insures a good hold, prevents any lateral motion and the absorption of fluids by the ivory insures that in twenty-four hours the screw will fit so closely that it will not allow the slightest motion between the fragments.

5. A great force is needed to drive the screws in and eventually they will be absorbed leaving the healed bone without defect.

6. In case of infection after the operation the ivory will not be absorbed until the suppuration has ceased.

7. Lengthening bones would be of benefit in shortening after fracture, faulty development, or injury to the epiphysis before full growth is reached.

8. The amount of extension obtained in these experiments was from three-eighths to one half inch in dogs, about the size of a fox terrier without the slightest injury to blood vessels or nerves, making it seem very probable that from two to three inches may be obtained in a bone as long as the average

human femur without any serious after effects.

It may be stated here that the method of sterilization of the ivory screws which we have found best is saturated solution of bichloride of mercury in alcohol, placed in the autoclave, under high steam pressure for

four hours. If these ivory screws are boiled they become warped and useless.

The experimental work for this paper was done at the University of Pennsylvania laboratories and published in detail in University of Pennsylvania Medical Bulletin in May 1908

A DESCRIPTION OF THE ENTEROPTOTIC WOMAN¹

B. RICHARD R. SMITH, M. D. CHAS. RAPINE, MICHIGAN

VISCERAL prolapse in woman is always attended by other structural abnormalities with which it is bound in close association. The prolapse itself is but a part of the picture. In our study of the subject or in an estimate of any individual case these other abnormalities should receive the same consideration as the viscera themselves.

With this conception in mind we may divide our women with enteroptosis into two groups. In the one we place those who during childhood and adolescence were well nourished, were more or less sturdy of form and firm of tissue who had deep chests, capacious upper abdomens and retentive abdominal walls, but who now present aside from these easily determined signs of a previous vigor some degree of visceral prolapse, considerable relaxation of tissue, a changed configuration of body and sometimes a loss of weight—indications to us of the ill health from which they are suffering. This is the so-called acquired form of enteroptosis.

In Fig. 1 we have a woman of this type. We note that she is well supplied with fat, is of stocky build, has a large capacious chest and an ample waist line showing that fundamentally she is of vigorous type. She has, however, a prominent abdomen, a diminution of the lumbar curve of the spine, and round shoulders. Her tissues are soft, her right kidney is easily palpable and the lower pole of her stomach is somewhat prolapsed.

The woman in Fig. 2 was originally of

vigorous build—enough so that we may include her in this group. This is best shown in the size and depth of the thorax. She has lost considerable weight through a chronic pelvic infection. The abdomen is very prominent (a common feature of this group) and she has the same change in configuration of the spine and relaxation of tissues noted in the last figure, with also a slight lateral curvature.

In Fig. 3 we have an enteroptotic woman who also belongs to this group. She has marked muscular weakness and insufficiency shown in the spinal curve is somewhat emaciated and relaxed, has a fair degree of visceral prolapse and marked subjective symptoms. She is 28 years of age—a farmer's wife. The woman had been in satisfactory health during childhood and much of her girlhood and was well nourished. She married at 17, worked very hard, had several children and lived on insufficient food. She had headaches was incapacitated for work and had a feeling of weight in the lower abdomen. She had gradually acquired the marked change in body configuration which we see here. This in brief is a characteristic history of women of this type. The strains that have caused their ill health are, we find, usually excessive. Very vigorous women do not usually give way under ordinarily favorable conditions the best of them will do so if the strain is great.

I have shown you here the most conspicuous features of this group. Let me add that the symptoms of these women are often quite as

¹Read before the Third Clinical Congress of Surgeons of North America, New York City November 3, 1907

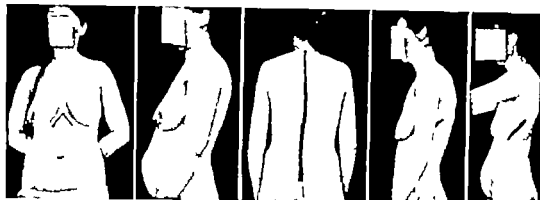


Fig.

Fig. 2.

Fig. 3

distressing as those of the second group which we are to discuss. The prolapse is on the whole much less in degree; the relaxation and signs of muscular insufficiency are often quite as great.

We now dismiss the first group and turn to the second, made up of those who from childhood up have presented certain defects in body structure—the so-called *congenital* form of enteroptosis.

In Fig. 4 we have a good example of this. We note in such a form that it is frail, has little fat, that the tissues are soft and relaxed, and that the whole body is wanting in vigorous development. We may I think, call these the *fundamental* or *primary* characteristics. Women of this group form a distinct type. Note in this figure also the size of the chest and the length and contraction of the middle zone of the trunk. These women may be short or tall—they are, of course, of much less than the average weight. The neck and limbs are as a rule longer than usual.

The slenderness of the whole body is well illustrated in Fig. 5 by a comparison of these two figures. Note the compact, vigorous form of the one on the right—then the one on the left.

I have spoken of the primary or fundamental characteristics of this habitus. We often see also in such women signs of muscular weakness or insufficiency. In Fig. 6 we have a normal figure in the erect military position. This is shown you in order that you may compare it with those that follow.

In Fig. 7 we have a number of well marked instances of weakness and muscular insufficiency. The most conspicuous ones show themselves in round shoulders, a diminution of the lumbar curve (which in the middle figure amounts to complete eradication) in more or less prominence of the abdominal walls, and in flatfoot. Muscular weakness—an inability to meet the work or strain placed upon them—plays the most important rôle in the causation of these deformities though other elements—structural weakness in the supporting ligaments—are of course important. To us such deformities commonly express fatigue—an easy consequence in these frail individuals of overwork, child bearing, the responsibilities of the home, indoor living, poor hygiene or any of the diseases which seriously affect the tone and nutrition. They are valuable guides in the estimate of the health of the individual in question. These commonplace deformities take on a new interest when studied in connection with enteroptosis. They are in general much less fixed than those say of the chest—they reflect more nearly the state of the woman's health. There is a tendency to betterment as the patient improves in health, even when receiving no specific treatment. They are not peculiar to women of this type (I have shown you them in the other group) but they are exceedingly common among them. These *muscular insufficiencies*, with the faults in attitude and structure which they induce are undoubtedly responsi-

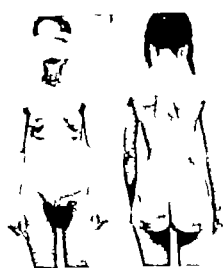


Fig. 4



Fig. 5



Fig. 6



ble for much of the backache pain in the sides and other parts of the body which these individuals frequently have. Dr. Goldthwaite will I presume discuss this phase of the subject, and I call attention to it merely to emphasize its importance. In the worst instances of prolapse these deformities are practically always present.

In Fig. 8 is a woman of this habitus of lesser degree, showing little signs of insufficiency. She is in good health and maintains a good attitude. Her right kidney is palpable and the lower pole of the stomach is found well below the umbilicus.

The thorax in the study of enteroptosis is of special interest to us, for the capacity of the abdominal portion is not only a factor (though by no means the only one) in determining the position of the abdominal viscera but in its size and shape it gives us much important information as to the woman's natural vigor and her early nutrition. We may say in this instance, for example (Fig. 9) that she was poorly nourished for a long period of her childhood and adolescence. Compare her chest (on the left) with that of an ordinarily vigorous woman (on the right) note the difference in size, shape and depth.

In Fig. 10 we see this same chest from different angles showing its shallowness, the sharp slant downward of the lower ribs, and

its narrow epigastric angle, all very characteristic of the women of this congenital group and distinguishing them perhaps better than anything else from women of the first group. Such a chest is always accompanied by visceral ptosis. What is more, if the inspection of such a chest is accompanied by an examination of the walls of the abdomen, to note their degree of relaxation, one may tell with considerable accuracy the degree of prolapse which she has. In this group where the prolapse is greatest the abdomen is flat, or comparatively so though child bearing is apt to increase its prominence somewhat. The prominence is greatest at its lowest portion, as is shown in the middle figure.

This woman will form a convenient case for a brief reference to the viscera. The tube was placed at six feet and a rapid exposure made so that the radiographs are practically orthodiagrammatic.

In Fig. 11 we have a plate taken with the patient lying on the back, immediately after a bismuth meal, and shows the stomach so well known to you as typical of enteroptosis. It is at present in a state of moderate contraction. A picture taken in this position does

This method gives us an accurate idea as to the degree of prolapse present. These little distortions from having the tube placed too near it, it is not to be recommended for constant use, much is destructive to the tubes and apparatus.

For better demonstration, drawings accurately measured from the plates are shown.

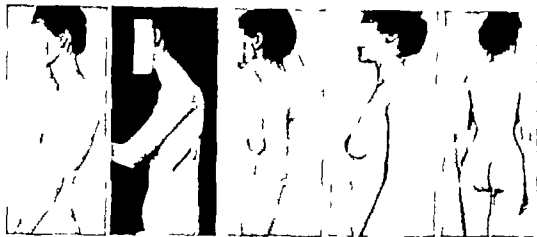


FIG. 7

not show the extent of relaxation possible in such a stomach. In another plate unfortunately spoiled, there was shown a sinking of the hepatic flexure and a marked prolapse of the transverse colon. The splenic flexure remained in place as is the rule though not an invariable one.

Fig. 12. This is the same stomach taken in the upright position and shows the lower pole fully four inches or more below the one taken in the lying position. This atony allowing such stretching out of the walls is typical of such stomachs. Normal stomachs allow no such excursions.

Fig. 13. To demonstrate the great laxness in the structures which limit the excursions of the stomach, this same patient was placed on the left side and the tube was placed at the back. The whole stomach lies down against the left abdominal wall. Compare with the next picture in which the patient is placed on the right side.

Fig. 14. This shows the lower pole of the stomach thrown way across the abdomen, nearly touching the right wall. This same laxness in those structures which normally prevent great excursion may be demonstrated in connection with the colon. It allows stomach and colon to assume various positions under gravity or the influence of its contents. It is to be borne in mind in reading X-ray plates, and should make us very cautious in

attaching a pathological significance to apparent kinks in the lumen of the bowel.

If we inquire into the early history of women of this congenital type we find that, in all well marked instances at least, we may trace the fundamental characteristics of this habitus to childhood. Inquiry will usually show that one or both parents, or even grand parents had similar characteristics. There is undoubtedly a strong hereditary influence here. In Fig. 15 we have a number of such children (ages 4, 6, 9, 11) all showing the primary characteristics of this habitus—slenderness, lack of fat and want of vigorous development. In these children we find the same muscular insufficiencies resulting in faulty attitude and flatfoot as found later in life. Note also the increased length of the limbs of these children. Such children are usually taller than others of corresponding age at least that has been the common observation. They are of course light of weight.

Fig. 16 by comparison brings out clearly the fundamental characteristics of this habitus in children. They are both eleven years of age.

Children however show very little prolapse of the abdominal viscera. In a total of 100 female children between the ages of three and fourteen (examined by Butler and myself independently) there were but six

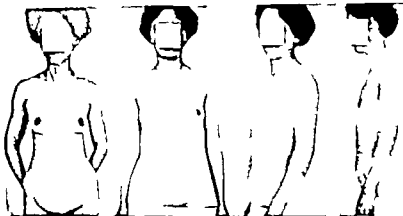


Fig. 9.

instances of palpable kidney and four of these were in children of twelve or over. In a series of 100 adults (all women) on the other hand, I found 43 had palpable kidneys. So we may say that, as far as the kidney is concerned it is not demonstrably prolapsed in childhood but becomes so later on. X-ray examination may reveal some sagging of the lower pole of the stomach and transverse colon but as compared with the adult, it is slight. After the age of ten and more especially in the years of puberty the widening of the pelvis becomes more apparent and with it there is a compensatory narrowing of the waist. With

the well nourished woman this is but mildly indicated and inconsequential. With the thin relaxed individual, on the other hand, this is pronounced. At this age we begin to find more frequently palpable kidneys and prolapse of the lower border of the stomach and colon.

In Fig. 17 we see a child of twelve years of typical frail build. Already the form is assuming the adult type the chest is small, shallow and slightly collapsed. This girl had a palpable right kidney there was no X-ray examination made.

Women are not born with displaced viscera, so that in one sense the terms congenital and



Fig. 10.

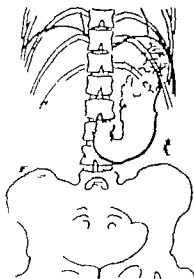


Fig. 1.

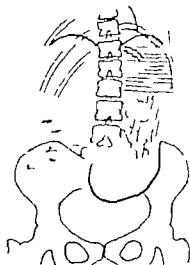


Fig. 2.

acquired as usually used are not correct. They should apply not to the prolapse itself but to the habitus or physical make-up of the woman. The visceral prolapse itself is but slightly indicated in childhood; may be first well demonstrated during adolescence and reaches its maximum during adult life. The nutrition during childhood and adolescence influences the size and form of the chest and upper abdomen more than any other factor. Once established, this form does not materially change during later life. There is some widening of the waist line in late adult life, but the depth remains shallow if it has been so earlier.

Since the nutrition of children may in most instances be bettered by proper hygiene, this fact contains a valuable hint in the prevention of enteroptosis. I would not be understood as saying that the abnormal form of the thorax causes the prolapse. The lessened amount of fat, the abnormal inner contour of the cavity itself and the relaxation and weakness of the limiting structures within the abdomen may be regarded I believe as the most immediate *mechanical* causes of the prolapse.

To return to the adult. We can draw no sharp line of distinction between women of the two groups which we have discussed. If

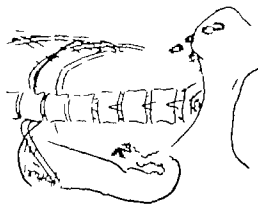


Fig. 3.

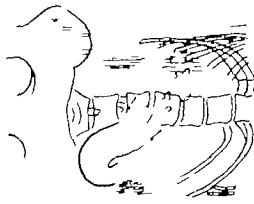


Fig. 4.

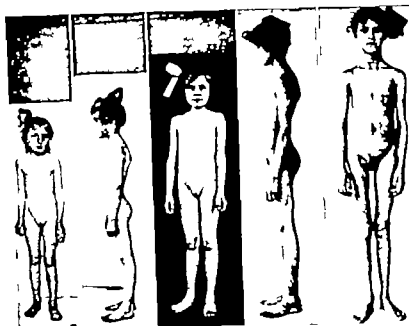


Fig. 5.

we examine a long series of women we will find many of mixed type. But in the purer forms of each group we find so many points of difference as to make a distinction quite necessary. In women of the first or acquired group we are not dealing with long standing fundamental defects, although when the anomalies are outspoken the symptoms are quite as distressing. With women of the second or congenital group on the other hand we are dealing with such defects and although she may often be brought into a state of good health her innate lack of vitality will at the best limit her activities to a greater or lesser degree. We may not reasonably hope at this late period to endow her with an energy she has always lacked. Women of this second or congenital group however vary greatly not only in the degree in which the anomalies exist but also in the kind and severity of the symptoms they present.

Those with the milder degree of enteroptosis and some in which the condition is fairly well pronounced but who are endowed with a stable nervous system (the best asset I believe they can possess) or whose lives are so well ordered that strain does not come frequently

or great upon them, will have good health as we ordinarily know it or only have symptoms under strain. A surprising amount of good may be done these enteroptotic women of moderate type by proper hygiene and treatment and even much worse cases may sometimes be improved. There are those however usually of marked degree, who seem doomed to perpetual invalidism and in whom the outlook for any therapeutic measures seems hopeless. An inventory must be taken of each case which presents itself. Her history in early life the stability of her nervous system or the lack of it, her frailness of body the amount of fat, the sufficiency of her muscular system or lack of it, the degree and description of the prolapse and the condition of her digestion are all most important in this estimate.

This brings us to a consideration of the symptomatology. When not in health they present the symptoms so familiar to us all that I shall not repeat them, and we may divide them at once into several groups.

In the first group we may place the psychic and nervous disturbances (which are often the most distressing that she has)

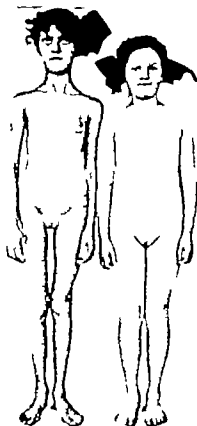


FIG. 6

In the second pain in the back, sides, feet, abdomen and other part of the body, and which may partly at least be ascribed to muscular weakness and faulty attitude.

In the third, those symptoms produced by the prolapsed organs themselves, as for example, the kidney, which may produce obstruction by kinking the ureter.

In the fourth, certain disturbances of function, principally those of menstruation, urination, and the digestive system.

The disturbances of the digestive system are by far the most important that we have to consider for they are a great factor in making worse her general condition. The exact nature of these disturbances is not altogether clear, but is to-day a matter of speculation and opinion rather than exact knowledge. Many of these enteroptotic women



FIG. 7

even when the prolapse is great, have good digestions and are free of symptoms, others, with care as to their diet and with rational living, are seldom disturbed, others suffer constantly from this source. More or less prolonged trouble with the digestive functions are very apt to follow exhaustive influences of all kind, and so commonly has this been observed that it has given rise to the opinion that we are dealing here with a neurosis. In the prolapse of the viscera and in the anomaly associated with it, we have a gross mechanical defect, and it naturally follows that some should hold the opinion that this is the cause of the trouble in many if not all cases. The process of digestion is an intricate one depending upon many factors for its normal state. Until all the factors and their individual importance can be better known, no opinion in this matter will I believe reflect the exact or whole truth. Certain facts seem fairly well established. The stomach contents, procured by the test meal plan, show in a series of cases no constant chemical changes. Most enteroptotic women are constipated even when they have no other digestive symptoms.



Fig. 18.

On investigation of those having digestive symptoms, we find a tardiness of the stomach and intestines to empty themselves—a stasis. In a considerable number of women we have examined who presented the familiar stomach symptoms with constipation we have found this to be a fact in all. This is best brought out by the bismuth meal and X ray and I show you here a typical case.

Fig. 18 This woman, with a well marked enteroptotic habit of the congenital type presented herself with a long list of usual symptoms, combined with distress or uneasiness after eating gas, marked constipation and occasional attacks of vomiting lasting several days. A bismuth meal was given and, with the patient standing, X ray plates obtained at intervals for the next nine hours, the last plate at the end of 20 hours. I am deeply indebted to Dr. Henry Hulst of Grand Rapids for his painstaking work in making these plates and for many suggestions.

Fig. 19. This first plate, taken at the end of two hours, shows a typical enteroptotic stomach containing the bismuth meal. A very small amount of bismuth has passed into the small intestine the hepatic and splenic flexures are filled with gas and are here shown in nearly the normal position. It does not show the transverse colon. A capsule of bismuth and air remains in the upper end of the stomach.

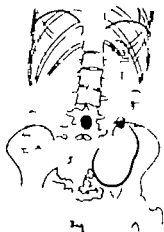
Fig. 20 This second plate was taken at the end of two hours and a half. It shows more bismuth in the small intestine but the stomach still contains most of it.

Fig. 21 The third plate, taken at the end of three hours and a half shows about the same thing. The stomach walls are folded on themselves above the bismuth, which is typical of the atony which such cases show.

Fig. 22 The fourth plate was taken at the end of four hours and 20 minutes. There is still bismuth in the stomach which now normally should be empty. There is more bismuth in the small intestine.

Fig. 23 The fifth plate, taken at the end of five hours and a half shows bismuth still in the stomach. The cecum is beginning to fill up. There is still bismuth in the small intestine. Ordinarily the filling up of the cecum goes hand in hand with the emptying of the stomach, so that when the stomach is empty the cecum is full. During the process bismuth is found in the small intestine, but not normally in large amounts.

Fig. 24. This plate taken at the end of six and a quarter hours, shows bismuth in the stomach, some in the cecum, some in the small intestine and heaped up more or less at the lower end of the ileum. Just what the normal condition is as regards the collection of bismuth at this point, is still a matter for discussion. As far as I know no extended



series of observations have been made to determine it. Ordinarily at least, one does not expect this to be pronounced.

Fig 25 (7th plate) At the end of seven hours the stomach is nearly empty. Bismuth is still seen in the small intestine, with the cecum not yet filled.

Fig 26 (8th plate) At the end of nine hours the stomach is nearly empty. Bismuth is still seen in the small intestine, with the cecum not yet filled.

Fig 27 (9th plate) At the end of twenty hours the cecum and transverse colon to its middle are filled with the bismuth. Although the bowels have moved not much bismuth has passed. There is none in the stomach or small intestine. With the cecum filled there is seen some sagging of the hepatic flexure and the transverse colon presents the usual prolapse.

We have in this case then a delay in the passing of food products in the stomach, small intestine and large bowel, decidedly abnormal at least in the stomach and presumably so in the small intestine and large bowel. We cannot, with any degree of certainty, diagnose any actual obstruction at any point in this case. It is a type frequently seen, and with cases that present more marked signs of constriction at various points in the alimentary canal, is a subject for present day discussion. The point I wish to make is that, as far as the X-ray examination goes one cannot be too certain that in many of these cases any actual obstruction exists. The

delay seems all along the line and depends upon factors as yet not clearly demonstrated.

I have purposely in this paper considered principally the anomalies of structure which are outside of the abdomen and which I believe fundamentally to be at fault in the prolapse. That local defects in support exist which allow the organs to assume a lower position in the abdomen is apparent that these defects are not the same in each individual case is demonstrated by the fact that the kidneys stomach and colon do not prolapse often in parallel degree. It may be the kidneys it may be the lower pole of the stomach and transverse colon. It may be the cecum or hepatic flexure or even the splenic flexure, although more stable, which shows more than its share of prolapse.

That in the prolapse or in its irregularity that in adhesions produced by inflammatory conditions, the result of infection or operation there may be conditions produced which mechanically interfere with the passing of the food products, would seem reasonable, and that they do has been the opinion of many competent observers. They are questions which I shall leave to others on the program whose clinical experience in this work has been greater than my own. My part in the symposium has been to speak of the individual herself and to emphasize the importance of not losing sight of fundamental matters in a nearer study of the viscera themselves.

HOW CAN THE SURGEON IN CIVIL LIFE BEST SERVE HIS COUNTRY IN TIME OF WAR?

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Surgeon General, United States Army

WHEN international complications assume menacing proportions and patriotism banishes class, party and sectional strife, thrilling the manhood of the nation with an overwhelming desire to stand by the colors, each untrained individual asks himself how and where he can serve to best advantage. In these hours of national stress the badly balanced are prone to indulge in hysteric utterances and acts that merely defeat the well-meaning aims that prompt these outbreaks.

Military preparedness demands of the navy—for which alone I am qualified to speak—an ability to strike a mighty and telling blow at the very outset, or to resist a vicious assault in the early days or perhaps, hours of an international strife. It is plain to be seen that an effective navy should be on a war footing at all times. Ships can not be built nor can the personnel be properly trained in its very special activities after the outbreak of hostilities. The medical department is the only branch of the service that is not fully equipped, in time of peace, for its responsibilities in time of war. This apparent unpreparedness will not be safe until the Naval Medical Reserve Corps is fully recruited and properly instructed in the very important humanitarian activities that will be required of it. In the early days of war it is the surgeons, with their assistant personnel and equipment, that are most imperatively needed. The physicians play their part later on.

When it is fully realized that a vicious blow may be struck at the outbreak of hostilities, and that the naval battle of the future will not, in all probability last over twenty minutes, and, further, that we may have twenty five per cent of casualties, then it will be seen that there may be anywhere from ten to thirty thousand wounded on our hands, accumulated in twenty minutes, a situation

unparalleled elsewhere. No army or navy has yet been properly prepared in the medical department for its responsibilities in time of war. It is to you patriotic surgeons that we turn in time of national stress to succor the wounded and to save your country from justifying the charge of apathy and indifference to its grave humanitarian responsibilities. The personnel of the regular establishment will be stationed almost to a man on the fighting ships, there engaged in purely military duties.

Before outlining in detail the field of work of the surgeons enrolled in the Medical Reserve Corps, let us consider for a moment the character of the wounds of naval warfare. Our new 14-inch guns have an effective range of about fourteen miles, and we now fire upon moving targets at a distance of nine and even ten miles in ordinary battle practice. The accuracy and rapidity of fire are amazing. Each of these monster rifles hurls a projectile weighing 1,400 pounds (two thirds of a ton of metal) at a velocity of 2,900 foot-seconds (about half a mile a second) and develops a muzzle energy of 66,000 foot tons. The powder charge for the 14-inch piece weighs between 350 and 400 pounds, and each monster shell carries as well, a large bursting charge of high explosive, so that at the moment of impact its destructive effects may be as far reaching as possible. The propelling and bursting charges of powder are made up of nitroglycerine, gun cotton, nitrocellulose, and a deterrent yielding largely as products of combustion, CO and NO₂, both dangerously poisonous gases, which have further complicated conditions aboard ship.

From the foregoing it will be apparent that in battle we shall have powder gases, not only from our own batteries, but from the explosions of shells hurled at us. Probably all the wounded will be more or less poisoned either by powder gas or smoke a grave

menace to life and a serious, complicating handicap to military effectiveness. That the seriousness of the menace from smoke is fully appreciated is apparent from the fact that the smokestacks of the new battleships carry thirteen inches of armor. A stack perforated low down or between decks might drive every body out of the fire room, or asphyxiate all serving there.

From the composition of powder gas it is evident that we shall have two types of poisoning, one resembling illuminating gas poisoning, the other irritative in its effects. Both may vary in degree. In the one group in mild cases, we find dilatation of the pupils, impaired vision, a fall in blood pressure, a rapid heart action and possibly some mental confusion. A larger dosage of powder gas may lead to unconsciousness and death. As the complicated structural peculiarities of our battleships necessitate the employment of artificial ventilation it is evident that should we run our ventilating systems during battle the best ventilated space at once becomes the most dangerous from powder gas contamination. After the battle of the Sea of Japan, Russo-Japanese War on board a ship that had run its ventilating system during the fight, every person in one compartment was either dead or unconscious. It is probable that the undue proportion of prostration attending shell wounds, formerly attributed to shock, is really due in part at least, to gas poisoning, and not to injury alone.

Shells are masses of steel with conical tips containing a detonating mechanism which, on impact, ignites a bursting charge, thus disrupting the shell into scores of fragments which shower a conical-shaped area from this point onward by reason of the momentum of the mass. Objects hit by oncoming shells are often set in motion thus becoming secondary missiles. The shell fragments vary in size, with edges generally rough and jagged and of relatively low velocity and usually so hot as to sear the tissues. The battery of a single ship may throw ten or more tons of metal per minute against the side of another the accuracy of fire these days justifies the belief that the percentage of misses will be small.

To offset this offensive development, the vitals of battleships are placed behind heavy armor and all objects that can be dispensed with which are likely to explode shells or become secondary missiles, have disappeared. The so-called basket masts of the American navy aim to withstand shell fire without falling and without exploding shells.

From the nature of the projectiles thus briefly described the seriousness of the wounds of naval warfare is evident. Whole limbs may be torn off disemboweling may take place or the entire body be peppered with small fragments. As the velocity of the fragments is relatively low lodgment is common, and impact against bone frequently causes splintering. Practically all shell wounds are infected by reason of their extent, character and contaminating surroundings, and they are usually seared as well. Burns from exploding shells and fire, and scalds from damaged steam pipes add to the horrors of the situation. A detailed consideration of these injuries is beyond the scope of this paper. Shell wounds involving bones and the nervous and vascular systems seem with interest. The frequency of traumatic aneurisms will be appreciated when it is known that in one hospital a Japanese surgeon operated upon one hundred and ten cases. Head injuries are varied and complicated. The number of deaths from drowning equal those from gun fire.

In time of war the personnel of the medical department of a battleship carrying a thousand men would in all probability be three surgeons and from seven to ten hospital corpsmen, with possibly an additional detail of untrained men who have no other battle assignments. The duties of these individuals will be to keep as many men at their fighting stations as possible. Any attempt to undertake operative treatment or to remove the wounded to a dressing station is out of the question during action. The wounded will have to lie where they fall.

If the casualties reached thirty per cent we should have some three hundred thirty killed and wounded lying about the decks of a single ship. The medical department of the ship

could not possibly cope with this situation unless it received assistance from outside. The breakdown would lead to cruel and unnecessary suffering and might assume the proportions of a national disgrace.

The assistance from without just alluded to must come from properly qualified surgeons in civil life who have previously been enrolled in the Medical Reserve Corps. The activities of the surgeon in civil life are purely humanitarian; he is a citizen of great value to his community. If through patriotism he offers the government his professional skill in time of national stress it is perfectly proper that his life should be safeguarded by service under the Red Cross in order that he may be reasonably sure to be returned to his community and resume his former activities. Under these conditions the surgeon in civil life—the enrolled Medical Reserve Corps officer—could render most valuable service to his flag. He would be out of place on the fighting ships by reason of his lack of military training.

I have devised a battle plan which will humanely and efficiently deal with the complicated problem of caring for the rapid accumulation of thousands of wounded. In describing this scheme in a paper of this sort it is deemed best to omit military and nautical details.

It is planned to charter large merchant steamers for service during hostilities, and to so remodel them that each will be capable of caring for about 1,000 wounded. Each one of these ships will be commissioned under the Red Cross and thus neutralized and will be assigned to a battleship division of the fleet. A division of the fleet on a war footing consists of four ships. The hospital space on each medical transport will be split up into four parts, each part being allotted to a ship of the division. The officers of the Medical Reserve Corps with their assistants, or hospital carpomen, will be assigned to the medical transport under the leadership of a few officers of the regular service. They will there be arranged in four groups, each group being assigned to the care of a particular battleship and its hospital space on the medical transport. During a lull in battle or

after the action is over the younger reserve corps officers, with their assistants and a specially prepared paraphernalia for effecting rapid occlusive and immobilizing dressings, will be put on board their previously assigned battleships there to care for the wounded on the firing line.

The senior reserve corps officers remain behind to prepare for the reception of the wounded on the medical transports, and afterward to act as consultants or operators as the case may be. Each reserve corps officer who boards a battleship should have with him at least two assistants, and an anæsthetist and a recorder as well as the equipment alluded to. The flow of wounded will be continuous and the fleet rapidly cleared in case a renewal of battle is contemplated. It will be seen that the wounded will be handled in an orderly way and will be under the care of the surgeons who first treated them at the firing line until they are finally disposed of at the collecting station or sanitary base. Each medical transport will be equipped with the necessary hospital appurtenances for operative procedures and other treatment as well as for diagnosis.

The plan under consideration provides for a large sanitary base to which the wounded will be rapidly transported, each group of medical reserve corps officers going on shore with the wounded under its care. Accurate and most valuable data will, no doubt, be available at the close of hostilities.

It is often necessary to care for the enemy's wounded which if humanely accomplished, will tend to an early resumption of friendly relations.

It is believed that in time of war the navy will require fully 1,000 officers in the Medical Reserve Corps, and it is urgently requested that properly qualified physicians and surgeons give this matter their consideration. Each reserve corps officer will be asked to interest from eight to ten assistants who would be willing to serve with him in time of war. These hospital carpomen might be recruited from among young physicians operating assistants, hospital internes, students or hospital orderlies. An operator

might thus take with him the operating team with which he is accustomed to work.

It will be too late properly to recruit and instruct the reserve corps after the outbreak

of hostilities. It is planned to give instruction through correspondence, by literature by assignment to the Naval Medical School, and by duty in the ships of the fleet for brief periods if feasible

REPORT OF INTERESTING BACTERIOLOGICAL FINDING IN A CASE OF PEMPHIGUS

ISOLATION OF AN ANAEROBIC BACILLUS FROM THE VESICLES AND TREATMENT OF THE DISEASE
BY AN AUTOGENOUS VACCINE. A PRELIMINARY REPORT

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FOR the past two months I have been studying a case of pemphigus in the hope of determining the etiological factors in this disease so mysterious as to etiology and so discouraging as to treatment. Before going into the bacteriological investigation it might be well to make a brief note of the clinical findings. The patient was a man 38 years of age weighing 250 pounds, very nervous, weak, and unable to sleep on account of the extreme discomfort produced by the disease. There was a marked ulceration of the mucous membranes of the pharynx and larynx resulting from the vesicular eruption with increased salivary and mucous secretions. Over the chest were two large areas made up of blebs and ulcerated bases due to the confluence of ruptured vesicles. In the course of a week fresh blebs appeared scattered over the abdomen and it was from these that our bacteriological investigations were made.

The method of procedure was as follows. The surface of the bleb was seared and the fluid from the vesicle aspirated. The cultures from this were made upon various media. The *staphylococcus epidermidis albus* was obtained from all of these blebs in pure culture on aerobic media. As this obviously was simply a contamination of the vesicular fluid by the normal bacteria of the skin, the possibility of finding an anaerobic micro-organism was considered and cultures were made on human muscle under agar. The young sep-

arate blebs were selected for this purpose. The growth was extremely slow, one to three weeks elapsing before a small white area was detected on the muscle. On microscopic examination this proved to be a growth of a very short, small bacillus, in some cases appearing segmented and in pure culture. The hanging drop made immediately showed the same bacillus slightly motile with a tendency to occur in clumps. With this as control a positive agglutination was obtained with the patient's blood serum. From this pure culture broth, milk agar, blood serum agar, and serum glucose agar were inoculated, both aerobically and anaerobically, but so far no growth has been obtained. Transfers to new bits of human muscle proved successful, the growth occurring much more rapidly than on the primary culture. Now a macroscopic growth could be detected as early as forty-eight hours. Hanging drop from these showed the same organism but with diminished motility. No growth was obtained on the non-inoculated bits of muscle treated anaerobically by the same method. In other words, the growth did not originate in the muscle itself. Specimens of muscle were obtained from different patients and various inoculations made from different blebs over a period of two weeks, with always the same result.

The presence of this micro-organism in the blebs and the fact that it agglutinated with the patient's serum suggested the possibility of this bacillus being the cause of pemphigus.

and for that reason a vaccine was prepared. It is, of course, far too early now to report as to the possibility of preparing an antitoxin but the vaccine prepared by the ordinary method is now being given. Beginning with 50 million bacilli, the dose was gradually increased every twenty-four hours, until a maximum of 400 million was reached at the end of a week. This amount was then repeated every other day. The fact that the patient has shown gradual improvement after these vaccinations, while not at all a proof of their curative value, as the disease, of course is

peculiarly prone to show improvement at various stages during its course without any apparent reason, nevertheless is sufficient to warrant us in carrying out further and more extensive investigation along this line.

Following the technique as described above, it is interesting to note that the same organism has been grown from two other cases of pemphigus, from one of which a pure culture has just been obtained.

I wish to thank Dr W. A. Fisher for suggesting the Noguchi method.

DECOMPRESSION IN CASE OF SEVERE INTRACRANIAL TENSION WITH FAILING CIRCULATION AN EXPERIMENTAL STUDY

By CHARLES H. FRAZIER, M. D. AND A. B. EISENBREY, M. D. PHILADELPHIA

SINCE the early nineties the subject of intracranial tension has received the attention of many investigators. Their contributions to our knowledge of the physiological factors concerned in the causation of increased tension and of the symptoms which this condition itself produces, based on animal experimentation, have been suggestive in directing the surgical treatment of clinical cases. Trauma, tumor, abscess, hemorrhage, hydrocephalus,—all, in varying degrees may produce symptoms referable to increased intracranial tension. These symptoms are attributed to interference with the blood supply of the medulla, and the heightened blood pressure encountered in such states is regarded as a beneficent compensatory measure.

It is unnecessary to review the advances made and the successes that have been achieved in the surgery of the brain since practical application of the laboratory findings has been made. Indications for the operation of decompression have been found in fields that were regarded as purely medical, and the range of usefulness for surgical therapeutics has been widely extended. In like measure the fuller knowledge and appreciation of the physiological factors involved

in any surgical attack upon the central nervous system has helped to surround such procedures with additional factors of safety.

In these investigations it has been our purpose to study decompression in relation to the intracranial disturbances following trauma, especially the lesions such as contusion, which are followed by a rapidly increasing intracranial tension.

The effect of decompression in cases showing symptoms of advanced compression, such as deep stupor, markedly high blood pressure, respiratory disturbances and vagus pulse has been most variable, and in many cases most disappointing at the time of the operation. While the symptoms may not indicate a particularly severe grade of intracranial tension or yet have been of long duration, in spite of an extensive decompression, paralytic symptoms arise, the respiration and circulation fail.

It is a well-known clinical fact that a majority of the cases of serious cerebral contusion such for example as attend basal fractures, recover spontaneously even though they may have reached the stage of vagus disturbance or even of vasomotor disturbance. With the compensatory increase in blood pressure in these cases decompression

may relieve some of the subjective symptoms such as headache or may even so diminish the intracranial tension that the vagus and vasomotor disturbances may subside more rapidly but the operation at this stage is clearly not a life-saving procedure, and therefore its performance as a routine is of very questionable propriety.

In the following experimental work our aim has been to study the effectiveness or the ineffectiveness of decompression in preventing a fatal termination in the more severe types of intracranial pressure or the types with fatal tendencies that is to say the types which pass beyond the stage of compensation to the 'Lähmungsstadium' (Kocher) with its failure of the respiratory and circulatory mechanism. It is in this group that operative intervention might be resorted to with propriety should it prove effective.

Because of the relatively limited time available for graphic registration of the physiological phenomena in individual experiments, it is evident that these symptoms must be brought about rapidly as compared with the gradual onset of similar conditions that is usual in clinical experience. A rapidly raised intracranial pressure with little or no time for readjustment or compensation constitutes a more severe and direct assault upon the vital centers than does an equal degree of pressure gradually produced.

Our experiments may be divided into two distinct groups. In the first group the increased pressure was produced by substances introduced between the cranium and the brain and in the second by causative factors within the brain substance itself.

Twenty three dogs and one Rhesus monkey were utilized in the experiments. In all cases the animals were under full ether anesthesia administered by intratracheal insufflation. Undoubtedly this method of anaesthesia affording as it does a very efficient artificial respiration prevented a discouraging mortality early in many of the experiments, when a too rapidly raised pressure had caused a temporary respiratory failure, before compensation had occurred the method was also invaluable when in the event of early respiratory failure without marked circulatory disturbance

it was desired to maintain the given intracranial pressure until the effects of decompression could be studied. Graphic records of the blood pressure and respiratory movements were made. Where feasible the actual intracranial pressure or changes in the volume of the brain were recorded on the same drum.

General compression was produced according to the method described by Cushing and our results, in so far as the physiological reactions produced are concerned are in accord with his conclusions. A small metal cannula was firmly screwed into a trephine hole in the parietal region after having first opened the dura. The cannula was connected by a T tube with a mercury manometer for graphic registration of the pressure of the solution which represented also the intracranial pressure. The other arm of the T tube was connected with a supply bottle containing normal saline solution that could be raised or lowered by cord and pulley attached to the ceiling.

Intracranial pressure so produced is uniformly distributed over all parts of the brain including the medulla. The effects upon respiration and circulation should be proportional to the degree of compression of the vessels and to the resulting anæmia of the vital centers in the medulla. In five experiments it was found that the increase of pressure necessary to call forth a response of the vasomotor center resulting in a slight rise of blood pressure averaged 10 to 15 mm. of mercury. This may be explained on the basis of a vasomotor response due in part to an anæmia of the cortex owing in all probability to the easy compressibility of the small superficial vessels supplying that region and in part to sensory stimuli from the dura. When the pressure was raised gradually but steadily but little change in the circulation except a slight rise in the blood pressure level was noted until the intracranial pressure approximated that of the general blood pressure or in the average case 100 mm. of mercury. Then the response was a rise in blood pressure which constantly tended in case of a further rise in intracranial pressure to maintain a level slightly above that of the intracranial pressure. If however the in

intracranial pressure was rapidly raised to a point considerably above that of the blood pressure level, vasomotor compensation did not come into play and circulatory failure rapidly supervened. This failure was ushered in by slowing of the heart through vagus inhibition then by an abrupt fall of blood pressure. The character of this circulatory failure indicates that in addition to the marked vagus effect there is undoubtedly a simultaneous paralysis of the vasomotor center.

In these experiments before the maximum circulatory effects had been attained the respiratory center gave evidence of involvement. Slowing and deepening of the respiration was noted when the intracranial pressure was still considerably below the level necessary to produce serious changes in the circulation. As the pressure was increased the respiration became shallow and still slower and ceased just before the circulatory failure began. In all cases the respiration was the first to fail, and although a phytia was prevented by intratracheal insufflation it is possible that the absence of the "respiratory pump" action may have been an added factor in promoting the rapidity of the fall in blood pressure. It was found extremely difficult to produce and maintain a pressure that would cause the marked respiratory or circulatory symptoms desired without a complete failure of both. In fact we were unable to produce a period of failing circulation of sufficient length to permit the carrying out of surgical procedures. The actual failure of circulation was always of rapid onset, and in order to try to save the animal it was necessary rapidly to reduce the intracranial pressure by lowering the supply bottle. The most striking fact from a practical standpoint was the frequency of failure to save the animal even by this most effective means of reducing the intracranial pressure, when once the failure of circulation had begun (Fig. 1).

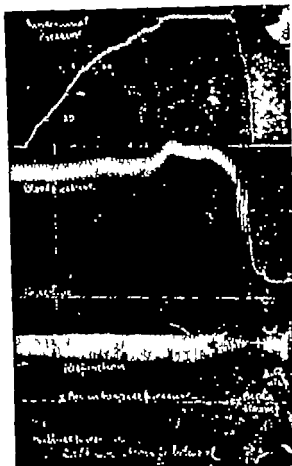
With a pressure sufficient to cause the maximum severity of symptoms, just short of actual circulatory failure with absence of or severe disturbance of respiration, with high blood pressure and with vagus pulse

decompression of the opposite temporo-parietal region was done and the usual condition of a tense and bulging dura was found. With the removal of an area of bone even relatively more extensive than the area removed in similar clinical cases, the intracranial pressure as shown by the manometer was but very slightly decreased and the symptoms showed practically no improvement. The same negative results were obtained when the procedure was carried out in the suboccipital region where though a less extensive decompression is possible the pressure over the medulla was more directly relieved. The further opening of the dura added but little to this except for slight improvement in respiratory function and lessening of vagus action. That portion of the brain which bulges through the opening rapidly increased in size and according to the work of Cannon (*Am. J. Phys.* 1901 vi 91) this must result in severe injury to the brain tissue itself as pressure on the edges of the dura and bone causes interference with its blood supply and edema results. In some of our cases the force of protrusion was sufficient to disintegrate the brain tissue.

Local compression. Increased intracranial pressure due to local compression was produced by the introduction of well-circumscribed masses such as small dilatable rubber bags between the dura and the brain in the parietal or in the occipital region. In our work a "tumor" of generally globular form and of a volume of 1 or 2 cc. caused a small but definite rise in blood pressure, which was of short duration. The transient nature and the smallness of the rise is probably to be accounted for by the fact that displacement of the cerebrospinal fluid and the compressibility of the larger venous channels permitted a readjustment of the impaired circulation in the localized area of the cortex from which the stimulation of the vasomotor center arose. When the volume of the tumor was increased to about 6 cc., the respiration became involved and at approximately 8 cc. the circulatory symptoms became manifest (Fig. 2). These volumes are relative only and varied with the cranial capacity of the animal used. When the size of the tumor

was carefully adjusted so as to produce just a beginning involvement of respiration and circulation, relief was readily afforded by a free and rapid decompression of the opposite parietal region in some cases even without opening the dura. In general it was evident that the power of accommodation and readjustment possible so far as the vital centers are concerned in the presence of a relatively large but circumscribed artificial tumor is rather great when such a tumor is situated over the cerebral cortex. If however such a tumor is placed in the occipital region the fatal tendencies are naturally much greater and of more rapid onset since the pressure exerted by even a small tumor is more directly transmitted to the underlying medullary centers. In these cases cerebral decompression in the parietal region was largely inefficient. It may be said for "local compression" as for general compression that when respiratory failure has occurred and the blood pressure has begun to fall neither decompression nor the collapse of the tumor serves to prevent a fatal termination. The regulatory mechanism of the vasomotor system is not called into play with the uniformity that it shows under general compression and the onset of respiratory and circulatory disturbances is more sudden, and these disturbances are of a more severe type.

Contusion In our attempts to produce increased intracranial pressure through causes lying within the brain itself the methods described by Cannon were employed. He demonstrated in cats that, following contusion of the brain substance by blows transmitted through the skull, an edema of the brain tissue is produced. This edema is the result of deficient circulation due to thrombosis of the small terminal arteries supplying the cortex, and is, he believes, the cause of the secondary pressure symptoms common in cases of head injury. He showed also that there is a marked tendency of this edema to progress. As a given area takes up fluid and swells, the circulation of the adjacent tissue is impaired. This in turn becomes edematous, and the process continues until the intracranial pressure so generated is sufficient to



FIG

obstruct the circulation of the vital centers and death ensues.

The period required for the development of an edema sufficient to affect the vital centers is evidently great, for in the time available for each experiment up to five hours we were compelled to deal with the more immediate effects of the contusion. These effects in so far as the blood pressure and respiratory findings were concerned agreed with those described by Cannon (Fig 3).

The rise of blood pressure directly following the injury was of short duration. In one case a slight but persistent rise unaccompanied by respiratory disturbances was relieved by trephining at the site of the contusion and the removal of a subdural accumulation of blood. Evidently the rise was caused by

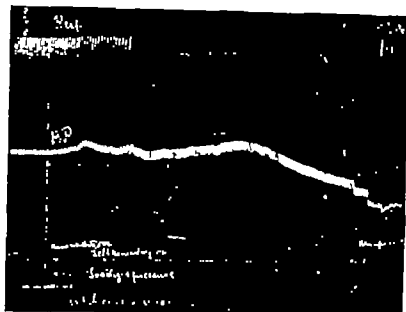


FIG. 4.

the local anemia of the cortex due to the pressure of this clot. In none of the experiments, during the relatively short period (four or five hours) over which they ran did any typical pressure symptoms develop. Although there were disturbances of the respiration amounting in some instances to a transient paralysis of that function immediately following the injury none of the respiratory symptoms typical of increased pressure were produced.

Since it is altogether probable that a great number of cases of traumatic injury of the skull presenting pressure symptoms of severe grade must owe the increase of intracranial pressure to an edema of the brain tissue it is a matter of regret that its experimental production has not been accomplished to a degree to make it a valuable for study in this connection. The brains of these animals showed evidence of severe contusion of the area over which the blows were delivered, but in no case even five hours after the trauma was there a tense and bulging dura found on opening the skull.

Embolism Following a suggestion received in a personal communication from

Cannon attempts were made to produce cerebral edema by causing embolism of the smaller vessels of the cortex through the injection of suspensions of lycopodium spores into the carotid arteries. A quite opaque suspension was made in normal saline solution and this was injected through an hypodermic needle into the common carotid artery close to its bifurcation. Usually 2.5 cc. of the suspension was injected into each carotid. The effects were immediate and most striking both on respiration and circulation, but they could not be ascribed to an increased intracranial pressure (Fig 4). There could be no doubt but that the blood supply of the centers concerned had been obstructed by the seeds. Decompression as was to be expected, exerted no beneficial effects.

Conclusions The physiological phenomenon, repeatedly observed throughout these experiments, was the failure to prevent a fatal issue once the circulation as indicated by the blood pressure, began to fail. No matter how the artificially increased intracranial tension was brought about the results were the same. Cases of severe cerebral contusion may be divided for convenience

FIG. 2.

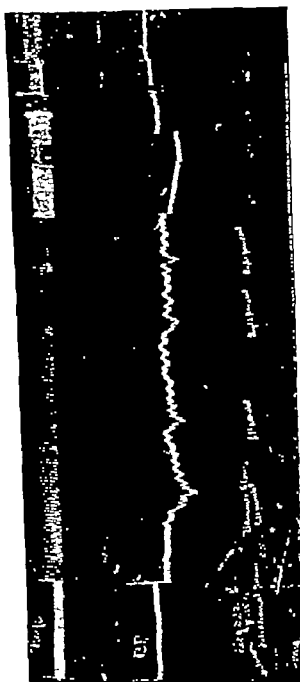


FIG. 4.



sake (1) into those in which the process what ever it may be becomes arrested at a point at which full compensation is provided for the increased intracranial tension (as we have reason to believe by stimulation of the vasomotor center and (2) those in which the process advances to a point at which the process continues to be operative until there is a breakdown of the vasomotor mechanism. Clinical experience has taught us that the first group spontaneously recover and the second group quite as regularly succumb. Decompression of the brain in our experimental work had absolutely no deterring influence upon the ill effects of intracranial tension in the serious cases. If the problem were altogether one of tension of encroachment upon the intracranial space and pressure upon the medullary centers, we have been led to believe that the removal of an area of the bone as in decompression will give immediate and very decided relief to the symptoms but in our experiments the intracranial pressure as measured by the manometer was but very slightly decreased.

To repeat, once the circulation and respiration began to fall (Fig. 1) the vasomotor or respiratory center was unable to recover its tone and function whether or no decompression was practiced. This laboratory observation explains the clinical failures which follow decompression in cases with circulatory and respiratory failure following cerebral contusion and is, we believe an observation sufficiently accurate and significant to warrant our looking with disfavor upon decompression measures as a means of saving life in the cases of intracranial trauma under consideration.

If it were a problem only of impairment of circulation the result of increased intracranial tension and the improvement of the circulation in the medullary centers by the relief of pressure, one would expect that the establishment of a decompression opening in the suboccipital region immediately over the medulla would be more beneficial than a temporal decompression. But here again our experiments showed that suboccipital decompression was of no more value than a temporal decompression. Were this not proved by experimental observation, one would have been inclined in actual practice to regard suboccipital rather than temporal decompression as the more rational procedure.

No doubt clinically there is a high degree of intracranial tension so high that the brain bulges through the opening in a shocking fashion but it must be remembered that in all probability there is a similar degree of tension in every other structure of the brain the medulla included that the tension is due to an intense edema, and that the establishment of an opening in the skull in the temporal region will have little or no effect upon the structure in the posterior fossa.

The inability to arrest the advancing edema by any surgical procedure coupled with the inability of the respiratory and circulatory centers to recover once the Lähmungstadium has been reached accounts for our failure to arrest or relieve the fatal tendencies of cerebral contusion by decompression and at once removes any sound argument in favor of its performance.

AN EXPERIMENTAL STUDY OF UNILATERAL HÆMATURIA OF THE SO-CALLED ESSENTIAL TYPE¹

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AND

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UNTIL a few years ago we held firmly to the tenets of our medical training that hæmaturia from one kidney must be due to a new growth, stone, or tuberculosis. All the standard text books of our student days taught that symptomless hæmaturia was angioneurotic in origin and not one of them told us that the disease could be unilateral.

Our attention was first called to this condition by the following case:

CASE 1: J. C. male aged 45. Complaining of several attacks of right-sided renal colic and constant bloody urine. Family and past history negative. Physical examination revealed a fat, well-nourished man with absence of any cardiovascular lesions. Both kidneys were in their normal position neither could be palpated on deep inspiration, and there was no tenderness on deep pressure in the loins. Cystoscopic examination showed normal bladder with blood coming from the right ureter and clear urine from the left. Ureteral catheterization showed blood, hyaline and granular casts from the right kidney and normal urine from the left. Bacteriological examination of right specimen negative. X-ray showed enlarged right kidney and an indistinct shadow which we thought to be a stone.

Operation: revealed an enlarged dark kidney lobulated with adherent capsule. Complete section from pole to pole and down to the pelvis showed nothing except a congested cortex. The kidney was closed by mattress sutures and from that day to the present time the patient has been free from colic and hæmaturia.

In studying the literature we find numerous surgeons have had many such experiences, and in searching for an explanation various reasons have been assigned as the cause of this most unusual condition. While Rayer in 1841 mentions unilateral hæmaturia, Socoloff in 1874 first reported a definite case which he ascribed to an interference with the nerve impulses to the renal vessels—a

condition which we now call angioneurotic oedema. Following this report, Sabatier, Leguen and Broca² record cases which they ascribe to this same angioneurotic cause. Just about this time Senator³ came out with a powerful monograph refuting the cause of angioneurosis and declaring local hæmophilia to be the exciting factor in these cases of unilateral renal bleeding. Aiken (quoted by W. E. Lower) follows Senator and reports seven cases of hæmophilia of the kidney these cases representing three different generations of the same family. Guthrie⁴ reports twelve cases of renal hæmophilia in the same family the inheritance being entirely through the females. Atlee⁵ reports three most unusual types of renal hæmophilia. The arguments against the theory are that hæmophilia is not a local process and these cases do not bleed from elsewhere the condition does not follow injury and does not occur in families.

In 1897 Klemperer⁶ created quite a stir among the internists by expressing his belief that the so-called essential or idiopathic hæmaturia is due to a paralysis of the vaso-constrictors with dilatation of the renal vessels and a resulting diapedesis. The condition he called angioneurotic oedema of the kidney and from this paper the various text book writers received the impetus for the teachings so often found therein.

The first article of dependable worth came from de Keersmaecker when he first called attention to inflammation in one or another

Rev. de Char. 284, 6
Ann. des Mal. des Org. Gen. Urin. 1860 p. 244.
Gaz. Hebdom. 361, No. 30.
Berl. klin. Wochenschr. 1861, 7.
Lancet, Lond. 1860, 213.
St. Bartholomew's Hosp. J. Dec. 1901.
Deutsche med. Wochenschr. 27, Dec. and
Ann. des Mal. des Org. Gen. Urin. 1901, 25.
Read before the Southern Surgical and Gynecological Association, December 1901.

Berl. klin. Wochenschr. 2, p. 223.

Read before the Southern Surgical and Gynecological Association, December 1901.

should be separately emphasized or whether these changes should be considered as an essential part of the localized or diffuse fibrosis, the fibrosis in a given case being especially marked in and around the glomerulus.

In the experimental investigation the dog was the animal constantly employed.

The experiments naturally fall in three groups:

First Those experiments in which it was attempted to induce a hæmaturia by interference with the vaso-constrictor nervous mechanism of the kidney.

Second. Those experiments in which a hæmaturia was attempted by the introduction of a nephrotoxic substance into the renal artery which had a special affinity for the vascular element of the kidney.

Third Those experiments in which the blood supply to the kidney was interfered with by clamping the renal artery by the use of a clamp devised by G. W. Stewart of the Cushing Laboratory of Experimental Medicine.

EXPERIMENTS OF THE FINAL SERIES

The vaso-constrictor nerves of the kidney reach the organ by two pathways, one set of nerves passes in along with the renal artery while the other and minor set enters the upper pole of the kidney entering the organ from the suprarenal body.

In this series of experiments three animals were employed. The left kidney was delivered by a transperitoneal operation and cleared of its surrounding fat. By careful dissection all structures going into the organ were severed, except the renal artery, vein and ureter. As a result by cutting the vaso-constrictor nerves there followed an acute vaso-dilatation of the renal vessels and an acute congestion of the kidney. For two days following the operation the urine was slightly increased in amount contained trace of albumen and occasional hyaline casts and erythrocytes. Following this period the quantity of urine returned to the normal, the albumen disappeared and with this disappearance the casts and the occasional erythrocytes also disappeared. The animals made complete recoveries.

EXPERIMENTS OF THE SECOND SERIES

Three animals were used. The left kidney was exposed in the manner previously described. Into the left renal artery was injected 10 mgrs. of sodium arsenate. The kidney was replaced and the abdominal wound closed. During the succeeding three days the quantitative output of urine showed first an increase, followed by a slight decline. The urine was albuminous and contained only a few erythrocytes. At the expiration of the time the animals were killed. Histologically the kidneys showed an acute dilatation of the glomerular vessels with but slight involvement of the epithelium. In the third animal an interstitial exudate was beginning to develop.

EXPERIMENTS OF THE THIRD SERIES

In these animals after delivering the kidney the renal artery was compressed with Stewart's clamp. In the first animal the compression was unintentionally very nearly complete. The output of urine by this animal was lessened. The urine was not albuminous and showed no histological elements.

With the remaining two animals the compression of the artery was partial. The urine following the operation was slightly decreased, showed a trace of albumen, a few hyaline and granular casts and erythrocytes. The animals were killed by chloroform on the fourth day. The kidneys showed cloudy swelling of the epithelium and occasional zones of coagulation necrosis.

An apology for the small number of experiments is in order but they conclude one step in our work and we record them to prevent repetition in other hands. In addition they apparently indicate that the condition known clinically as "Idiopathic hæmaturia" is not dependent upon first an excessive amount of arterial blood reaching the kidney, secondly it is not dependent upon an acutely developing vascular injury, thirdly it is not induced by lessening the quantitative input of arterial blood, lowering the kidney arterial pressure and inducing a passive congestion by interfering with the arterial side of the renal circulation.

These experiments would apparently contravene Klemperer's theory of angioneurotic edema and also Albarran's idea of a slight lesion of nephritis being a sufficient cause of the unilateral hematuria.

Finally if we may be allowed to theorize

it seems most probable since acute nephritis can be eliminated that the clinical condition is due to a chronic type of nephritis one in which there is a rupture of a glomerular vessel and the bleeding kept up by the high local pressure so constantly found in chronic nephritis.

RETROGRADE INCARCERATED HERNIA HERNIA EN W

BY LOUIS FRIEDMAN M D NEW YORK CITY

Lecturer on Gynecology New York Polytechnic, Cystoscopist, Harlem Hospital

In 1895 Maydl (3) reported two cases of strangulated hernia the sac contents in one case was a loop of appendix, its distal end remaining within the abdomen. In the other the sac contained a loop of Fallopian tube its distal end within the abdomen. In both cases the distal portions of these organs were gangrenous, while the proximal being within the sac, showed only moderate interference with its blood supply. He coined the term for this type of strangulation "retrograde incarceration" understanding thereby that the incarcerated portion of a herniated organ lies not in the hernia sac, but within the abdomen near the hernia constricting ring, while that part of the organ lying toward the periphery from the hernia orifice and within the sac is either nearly normal or usually shows evidence of only moderate interference with its blood supply.

In retrograde incarceration of intestine two or sometimes three distinctly separate loops of gut are found in the hernia sac, while the incarcerated loop or so-called "connecting loop" (*Verbindungschlinge*) is within the abdomen near the hernia orifice.

De Beule (25) aptly gives it the descriptive name of hernia "en W" the two loops in the sac with the one loop in the abdomen resembling the form of the letter "W".

Benno Schmidt's (1) case seems to be the first one on record, a woman dying from the effects of a large strangulated umbilical hernia. At autopsy several loops of unchanged small intestine were found in the sac,

while near the constricting ring there was an incarcerated loop within the abdomen completely gangrenous. Lauenstein (2) in 1894, first described this unusual and interesting form of strangulated hernia.

Since then while a number of papers and case reports have appeared in German literature about retrograde incarceration, there is but scant reference in American literature none of the books on surgery mention it, and no paper dealing with the subject nor any case reports have so far appeared. *Progressive Medicine* June 1912 gives an extract of two of Lauenstein's cases, the only other reference being in Sultan's translated work on Abdominal Hernias. While an uncommon type of hernia it is of sufficient importance that a thorough description of it should be incorporated in every text book on surgery.

My own case which was reported before the Harlem Medical Association was not recognized by me as one representing hernia "en W" with incarcerated connecting loop and in my report then I made mention of the interesting point that a gangrenous loop of gut was pulled out of the abdominal cavity while the loops in the sac were but moderately strangulated. In speaking to Dr Alexis V Moschcovitz of New York about the condition found he called my attention to the fact that it was one of retrograde incarceration for which enlightenment I herewith thank him.

He has had two cases in one of which he made the diagnosis of incarcerated con-

form as the exciting cause of idiopathic hematuria and showed the definite entity of unilateral nephritis. Pousson reports cases of symptomless hematuria in which he found inflammatory alterations in the glomerulus. Hofbauer² also describes changes in the glomerulus. Laurent³ and Israel report cases of hyaline degeneration of the blood vessels while Rovsing of Copenhagen⁴ found circulatory disturbances and thickening of the capsule. Albrecht and Lowenhart (quoted by Albarran) describe interstitial lesions in the pyramids.

The most valuable contribution to nephritis as the cause of essential hematuria came from Kretschmer⁵ in which he collected 129 cases from the literature, 52 of which showed definite microscopic changes of nephritis. He principally found lesions of the glomeruli and desquamation of the epithelium in the convoluted tubules. Lower⁶ reports two cases with nephrectomy in which the microscope showed nephritis. Casper⁷ writes that nephritis is at the bottom of all these cases and if delicate tests for a sufficiently long time are carried out albumen and casts will be found falling, the case may still be one of *nephrosis circumscripta*. In this connection Schuller⁸ and Israel⁹ both say nephritis can exist without casts or albumen. Rigdon¹⁰ reports two positive cases of nephritis as the exciting cause and argues that hematuria is the initial symptom of chronic nephritis. Schenck¹¹ reports two cases showing nephritis. Kotzenberg¹² reports twelve cases which he believes due to a bilateral toxic nephritis. He thinks the hemorrhage in these cases is the initial symptom of the nephritis, but at the time of observation only one kidney showing blood. This is most untenable, for very rarely does the other kidney ever bleed.

Along with these cases, E. H. Richardson in a personal communication to me records a case of bilateral hematuria relieved by a right-sided nephrotomy from which an excised piece of kidney showed parenchymatous nephritis.

Turning aside from the consideration of nephritis we find Fenwick¹³ describing angiomata of the papillae as the cause of the so-called essential hematurias and reporting six such cases. To support Fenwick we find McGowan (quoted by Lower) Pilcher¹⁴ Cabot,¹⁵ Whitney¹⁶ reporting similar cases and Hale White¹⁷ records five cases of angiomata of the papillae seen in Guy's Hospital. Rovsing (Ibid) and Israel (Ibid) both admit the presence of nephritis as a cause of symptomless hematuria, but argue that usually there must be some more definite cause for the bleeding and lay stress on tuberculosis, new growths and ascending infection. In this connection, Albarran,¹⁸ Kapsammer (quoted by Albarran) and Davidsohn (quoted by Albarran) report cases showing minute foci of tuberculosis. Albarran says the least lesion of nephritis is capable of determining the vascular or angioneurotic modification capable of leading to bleeding. Rovsing (Ibid) says local infection plays a more important part than toxins in the production of the nephritis and Chute¹⁹ argues that the nephritis may be toxic or infectious. He further says the infectious type may show blood and pus or an absence of pus with inflammatory changes remaining in the kidney after the infectious agent has disappeared. Billings (quoted by Lower) reports a few infectious cases due to colon bacillus which were treated successfully with autogenous vaccines. Squier²⁰ reports a case relieved by nephropexy but a careful study of his report would force the burden of cause of cure upon the nephrotomy the evident cause of blood and pus being an unilateral nephritis of infectious origin.

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Mitt. aus dem Grenzgeb. der Med. u. Chir. 12.
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Wien. klin. Wochenschr. 1900, 271, 277
Klin. der Med. Berlin, 1900
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Ann. Fran. d'Urol., 1900, p. 200.
Am. J. Urol., Vol. 10, 1907
J. Am. M. Ass. Dec. 1907

Since our first case we have personally observed four other cases in private work as follows:

CASE 2. Male. M. L. J. Age 40. Farmer giving history of persistent bloody urine for past year with dull pain in right loin. X-ray and physical examinations negative. Cystoscope showed a normal bladder with blood in abundance from right ureter. Microscope disclosed hyaline and granular casts from the right specimen, with absence of bacteria, while the findings were negative in the left specimen. Operation upon the right kidney showed an organ normal in appearance and size. Bisection disclosed a narrow dark cortex, considerable congestion between the pyramids, with a few small clots in the pelvis. The kidney was closed with mattress sutures and after the fourth day the urine became clear. The patient gained rapidly in weight and has had no pain or hæmaturia since his operation. Three months after operation the urine showed no albumen but a few hyaline and granular casts.

CASE 3. Female. Mrs. M. W. multipara age 35. Complaining of repeated attacks of mild renal colic with intermittent hæmaturia. At times the urine was very bloody. Past history very suspicious of gonorrhea. X-ray negative. Cystoscope showed slight congestion of trigone with a prolapsed, blood smeared right ureteral orifice. Remainder of bladder normal. Catheterization of ureters showed blood, with abundance of granular casts from right side nothing in left specimen. Bacteriological examination negative. Operation disclosed a very large lobulated kidney with many adhesions, making delivery quite difficult. Nephrotomy showed several patches of scar tissue scattered throughout the parenchyma but nothing else. The kidney was closed and during the convalescence the patient had a few attacks of mild pain due to the passage of clots. The urine cleared up before she left the hospital and there has since been no pain or hæmaturia.

CASE 4. Male. P. M. J. age 54. Complaining of profuse intermittent hæmaturia with absence of pain. Physical examination showed a pronounced anemia with great loss of weight and strength. Palpation of the kidneys and X-ray examination revealed nothing. The cystoscope showed a blood stained bladder with the hæmorrhage coming from the right ureter. Catheterized specimens showed blood, hyaline granular and bloody casts from the right kidney while the left specimen was negative. Bacteriological examination and tuberculin test were negative. Operation and bisection of the kidney showed nothing abnormal but congestion. Following the operation the urine became clear and has remained so to the present time. This patient made very rapid gain in weight and has been actively at work since leaving the hospital.

CASE 5. Male. H. B. age 48. Farmer and alcoholic. Gives history of periodic attacks of

hæmaturia without pain or other symptoms. The usual examinations together with X-ray showed nothing, while the cystoscope revealed a normal bladder and normal ureteral orifices. Catheterized specimens disclosed an absence of blood from both sides, but albumen, hyaline and granular casts from the right kidney and normal urine from the left. Two subsequent ureteral examinations one month apart gave the same findings plus blood from the right side one time. Between these examinations the patient had several attacks of hæmaturia but living ninety miles distant, I have never seen him during an attack. He has steadily refused operation, but the case we believe to be one of unilateral nephritis with hæmaturia as the initial symptom and a nephrotomy certainly indicated.

Just how nephrotomy helps these patients is quite an interesting question but it is to be presumed that it relieves congestion and by dissolving the continuity of the blood vessels in some way interferes with the afflux of blood.

Experience has shown that nephrotomy has a favorable influence on the hæmorrhage and pain of toxic nephritis and owing to the compensating hypertrophy of the intact parts of the kidney the functional capacity does not seem to be lessened by incision and prompt suturing. Furthermore, in not a single case reported in literature has this procedure of a simple nephrotomy failed to relieve this so-called *essential hæmaturia*.

A SERIES OF EXPERIMENTS TO DETERMINE THE CAUSE OF THE SO-CALLED IDIOPATHIC HÆMATURIA

The experiments so far performed have been conducted for the purpose of excluding certain acutely developing vascular changes as being the principal cause for the occurrence of blood in the urine.

In the clinical condition in which this so-called idiopathic hæmaturia develops one of the constant findings at operation is either a patchy or diffuse fibrosis of the kidney. In addition to these interstitial changes, chronic changes involving the glomerulus are fairly constantly seen, which with certain limitations might be called a glomerulonephritis. In this connection the question naturally arises as to whether the glomerular changes

should be separately emphasized or whether these changes should be considered as an essential part of the localized or diffuse fibroid the fibroid in a given case being especially marked in and around the glomerulus.

In the experimental investigation the dog was the animal constantly employed.

The experiment naturally fall in three groups.

First Those experiment in which it was attempted to induce a hamaturia by interference with the vaso-constrictor nervous mechanism of the kidney.

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In this series of experiment three animal were employed. The left kidney was delivered by a transperitoneal operation and cleared of its surrounding fat. By careful dissection all structures going into the organ were severed except the renal artery vein and ureter. As a result by cutting the vaso-constrictor nerves there followed an acute vasodilatation of the renal vessel and an acute congestion of the kidney. For two days following the operation the urine was slightly increased in amount contained a trace of albumen and occasional hyaline cast and erythrocytes. Following this period the quantity of urine returned to the normal the albumen disappeared and with this dyspepsia also and the occasional erythrocytes also disappeared. The animal made complete recoveries.

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Three animals were used. The left kidney was exposed in the manner previously described. Into the left renal artery was injected 10 mgrs. of sodium arsenate. The kidney was replaced and the abdominal wound closed. During the succeeding three days the quantitative output of urine showed first an increase followed by a slight decline. The urine was albuminous and contained only a few erythrocytes. At the expiration of the time the animals were killed. Histologically the kidneys showed an acute dilatation of the glomerular vessels with but slight involvement of the epithelium. In the third animal an interstitial exudate was beginning to develop.

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By LOUIS FRIEDMAN M. D. NEW YORK CITY
Lecturer on Gynecology New York Polytechnic, Cystoscopy, Barlow Hospital

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He has had two cases, in one of which he made the diagnosis of incarcerated con-

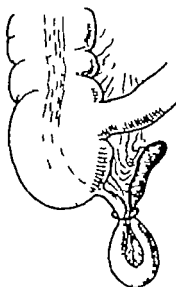


Fig. Retrograde incarceration of appendix.

necting loop" before operation. In either case resection was indicated (Personal communication)

Report of case. The patient a physician 40 years of age was admitted to the Sydenham Hospital on August 22, 1901. He had had for twenty years a left inguinoscrotal hernia, always reducible. On the morning of August 23 it suddenly became strangulated and efforts at reduction by taxis proved unsuccessful. Vomited twice. Admitted to the hospital at 5 P.M. operated at 8 P.M.

Examination showed a large inguinoscrotal tumor the size of a man's head resting in the middle of the thigh, very tense, painful, tympanitic. Pulse 100. Temperature normal. Chloroform anesthesia.

Incision parallel with Poupart's ligament. constriction at external ring. considerable fluid in sac and several loops of small intestine, reddish blue, edematous, but responded promptly to application of heat. Upon enlarging the ring a great quantity of moderately thick fluid escaped from the abdominal cavity and putting on one of the loops of gut a coil of intestine 9 inches long, deep reddish blue in color, edematous, the peritoneal covering of which had lost its characteristic glistening appearance came into view. Its mesentery contained several veins of hemorrhages, bile pulsation in the vessels was local. The mesentery of this incarcerated loop was within and caught in the grip of the hernia orifice (Fig. 4). The constriction rings on the loops of gut within the grip of the hernia orifice were normal in color.

Application of heat to this intra-abdominal loop did not restore its vitality. resection, with end to-

end anastomosis, Murphy button was therefore done; the hernia repaired, Ferguson method. Patient stood the operation well, which lasted an hour and fifteen minutes.

Highest post-operative temperature 101° pulse 100. Passed flatus the next day; bowels moved on the fifth day. Button passed on the thirteenth day. Uninterrupted recovery.

In retrograde incarceration the organs involved may be the appendix (Fig. 1) Fallopian tube a Meckel's diverticulum omentum and intestine most often small intestine. When gut is involved, the hernia is usually of large size and long standing; the majority of cases recorded were in patients past middle age. Exceptions were Taka vassu's (27) patient a boy 7 years old Polya's (9) case an acute hernia with incarceration in a male 23 years old and Lauenstein's (8) first case a young man of 24 also acute hernia. Right-sided inguinoscrotal type was the most frequent—femoral in a few umbilical in one, inguino-properitoneal in one.

In the sac are found, side by side (Fig. 4) or one behind the other, two distinctly separate loops of gut, the incarcerated loop or "connecting loop" being within the abdomen near the hernia orifice its mesentery sometimes caught in the grasp of the constricting ring. In a number of cases caecum and appendix (Fig. 3) with a distal loop of ileum, were in the sac, while the proximal loop incarcerated, was in the abdomen. Cases reported by Wisting

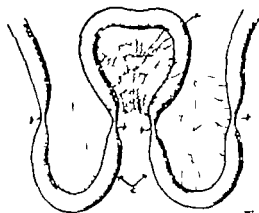


Fig. 2. Retrograde incarceration, or hernia, as it would appear spread out. (a) Abdominal loop (b) constriction rings (c) loops in sac

hausen (5) Pringle (10) and Slebert (21) contained three loops of gut in the sac and two connecting loops in the abdomen.

It is most always the connecting loop" found within the abdomen which suffers more and evidences grave interference with its blood supply the loops within the sac may be normal or only moderately strangulated. In a number of instances the "connecting loop" was resected in a very few the loops within the sac, as well as the connecting loop needed such attention.

It is interesting to note that the constriction rings (Fig 2) on the loops of gut that is, which are within the grasp of the hernia orifice, show as a rule no interference with its blood supply although gathered together in ribbon like folds and furrows, and appear in high contrast as a line of demarcation between the loops within the sac and that within the abdomen. This was very marked in my own case.

Thrombosis of the mesenteric vessels, with hemorrhagic infarcts in the mesentery is present in severe grades of connecting loop" incarceration. Some observers believe that the thrombosis is a primary pathological condition.

Increase in the length of the mesentery of the small intestines due to stretching has been noted particularly in old subjects with long-standing large hernias (Klauber and Lauenstein).

A highly important and striking fact is the extreme rapidity of gangrene in the incarcerated connecting loop. Fluid is mostly always present in the abdomen. It may be either clear turbid, or bloody. Bloody stools follow where resection was not necessary showing the intense engorgement in the incarcerated loop.

1 What causative factors enter into the formation of a retrograde incarcerated hernia?

2 Why is the blood circulation in the connecting loop usually more interfered with than the loops in the sac?

The theories advanced have been many but so far satisfactory or plausible explanation is still wanting in answer to the first question. Theories are that

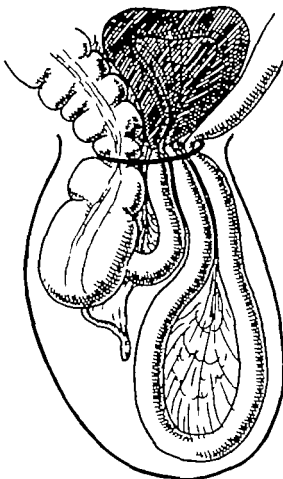


Fig 2. Hernia en W. It's cecum, appendix, and portion of ileum in sac. Incarcerated connecting loop in abdomen.

1 Originally a continuous loop of gut herniated into the sac and that its middle portion prolapsed back into the abdomen.

2 By taxis the loop of gut was forced back into the abdomen (Wistinghausen).

3 Retraction of gut through forces within the abdomen (Neuman).

While all this may be possible it is hard to prove satisfactorily and may occur only where a large ring is present, which is not always the case. Taxis for reposition was not even attempted in many cases reported. It seems to me that a positive explanation is not at hand and we must accept the fact that, particularly in large hernias two distinctly separate loops of gut can prolapse

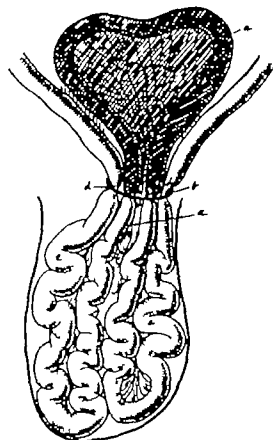


Fig. 4. Diagrammatic presentation of the author's case of hernia on IV. (a) Gangrenous loop in abdomen, (b) hernia orifice (c) loops in sac, moderate strangulation (d) mesentery of incarcerated "connecting" loop.

into the sac, while its connecting loop coincidentally remains in the abdomen.

Of greater interest is the answer to the second question. In my own case the mesentery of the incarcerated connecting loop was within the grasp of the hernia orifice, and so directly either by pressure or by kinking on the sharp edge of the ring, its blood supply was shut off. Jackh (15), Klauber (8) and Halm (12) found the same conditions present in their cases, while Neuman (13) and Sultan (12) observed that the mesentery of the incarcerated loop was not within or caught at the constricting ring, and yet its vascular supply was interfered

with. Viewpoints on the second question are:

1. Direct pressure and constriction at hernia orifice upon mesentery and its vessels.

2. Torsion of the mesentery on its long axis, with a fixed point at hernia orifice.

3. The extraordinary pull and tension exerted upon the mesentery of the "connecting loop" by the loops and its mesentery situated within the sac. Neuman (13), Lauenstein (20) and Sultan (12).

4. The mesentery of the connecting loop passes the constricting ring twice by doubling upon itself so producing interference with blood supply. Maydl (3), Klauber (8), Halm (12) and Jackh (15).

Neuman in his case, during operation demonstrated to his assistants that he could readily interrupt the circulation in the mesentery of the connecting loop by strongly pulling upon it at its root.

Gangrene has occurred in one or two loops found within the sac, while the connecting loop was normal.

Experiments on dogs have been carried out by Takayasu (27) and Lauenstein (17 and 41) to determine if possible the manner in which circulation is interfered with in the incarcerated loop.

While it is highly interesting to determine what the mechanism may be whereby this form of strangulation is produced, or how and why the vascular supply is interfered with more readily in the connecting loop, the practical indications are more important to know and to remember that such retrograde incarceration does occur to be on the lookout for it, particularly so in large, long-standing hernias where strangulation has occurred to recognize and interpret the symptoms and signs which the incarcerated loop does bring forth, to always investigate where free fluid, particularly bloody, escapes from the abdomen when liberating the hernia constricting ring, so that the possibility of overlooking the incarcerated loop lying within the abdomen may not occur.

The symptoms and diagnostic signs will depend upon local conditions within the sac, as in ordinary strangulated hernia, but the

principal and characteristic signs depend upon the incarcerated loop within the abdomen.

The following have been observed as being present in the few cases reported

1 Large size tumor in scrotal region sometimes asymmetrical due to the distended separate loops.

2 Colicky pain in lower abdomen on the side of the hernia pain on pressure on side of hernia, right above Poupart's ligament.

3 Rigidity above Poupart's ligament on side of hernia.

4 Local tympany due to the distended incarcerated loop.

5 Presence of sausage like mass in lower abdomen on side of hernia

6 Perceptible asymmetry of lower abdomen, the hernia side being higher

7 Dullness on percussion in flanks, due to fluid and perceptible fluid wave.

8 Blumberg's sign of peritoneal irritation may be present.

9. Greater abdominal than scrotal tenderness.

After opening the hernia sac

1 The presence of two or three separate loops of gut.

2 Escape of fluid clear or bloody from the abdominal cavity after cutting the constricting ring

The time elapsed since incarceration has taken place will naturally vary the degree of symptoms present.

Because of the extreme rapidity of gangrene in the incarcerated loop early operation is of great importance.

So that, given a long-standing, large size hernia which has become strangulated where there is either pain rigidity tumor mass immediately above Poupart's ligament on the side of the hernia, with asymmetry of lower abdomen a tentative diagnosis of hernia "en W" may be made while if such signs are not present or are not interpreted correctly when upon operating there are present two or three distinct loops of gut in the sac with escaping fluid from the abdomen, an incarcerated connecting loop is to be thought of and looked for. So far about 30 cases have been reported—with my case and two of Dr Moschcovitz, 33



Fig 5 Author's case of retrograde incarcerated hernia.

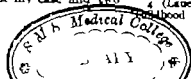
CONDENSED EXTRACTS OF SYMPTOMS AND PATHOLOGY FOUND IN SOME CASES REPORTED

1 (Lauenstein 893) Patient 24 years old. Acute hernia. Right inguinoscrotal tumor size of three fists. Mass tympanitic, irregular in outline. Two loops of gut in sac, third loop in abdomen. Connecting loop deeply injected. No resection.

(Lauenstein) Fifty-two years old. Right inguinal hernia for 34 years. Right scrotal region size of child head, tympanitic. Strangulated 2 hours. Abdomen distended and painful on pressure. Hernia as contained two loops of gut on mesentery several spots of infarcts. Connecting loop in abdomen deeply injected. N resection.

3 (Lauenstein) Fifty-eight years old. Large size, old-standing hernia. Right inguinoscrotal tumor size of child head Strangulated 2 hours. Abdomen tender in sac, cecum, appendix, and ileum. Incarcerated loop small intestine 65 cm. dark red, mesenteric infarcts. Resection. Death.

4 (Lauenstein) Forty-seven years old Since childhood right-sided inguinal hernia Tumor



right scrotal region size of child's head. Great pain in right lower quadrant of abdomen. In sac, two loops, one 24 cm. the other 43 cm. long. Connecting loop in abdomen, 80 cm. long. Bloody serum in abdomen. Constriction rings on intestine evidence no circulatory disturbance.

5 (Lauenstein) 31 yr., age 30. Since childhood, left-sided hernia. Operated 2½ hours after strangulation. Scrotum tympanitic. Asymmetry lower abdomen. Left more distended than right. Cecum and ileum found in left-sided hernia sac. Connecting loop of ileum in abdomen.

6 (Lauenstein) Seventy-three years old. Twenty-eight year-old right-sided hernia. Scrotum asymmetrical. Right lower abdomen more resistant than left and more distended. Asymmetry lower abdomen. Two loops with its mesentery in sac, densely congested. Bloody serum from abdomen. Third loop incarcerated pulled out of abdomen.

7 (Lauenstein) Patient 67 years old. Right-sided hernia, 20 years standing. Operated one hour after strangulation. Scrotal tumor size of man's head elastic, tympanitic. Two loops in hernia sac, congested, punctiform hemorrhages in mesentery. Third loop in abdomen, deeply congested. Its mesentery too deeply congested.

8 (Linderken) Patient 38 years old. Since 8 years ago, double hernia. Right-sided incarceration, size of man's fist. No abdominal symptoms present. Two loops in sac, one in abdomen. Resection of all three loops.

9 (Halm) Right inguinal. Scrotal tumor size of two fists. Abdomen: right lower quadrant rigid, tender on pressure. Dullness on percussion in flank. Much reddish fluid in abdomen.

(Jackb) Patient 74 years old, female. Femoral hernia, right side. Right above Poupart's mass distinctly palpable sharply defined, distended, tympanitic, making the impression of distended gut. In sac two loops of gut in abdomen, connecting these loops. Third one dark red, deeply injected hemorrhagic infarct in mesentery. Intestines in sac hardly injected. Bloody fluid in abdomen. Resection. Recovery.

11 (Jckb) Patient 63 years old, male. Old standing scrotal hernia, right side lower part of abdomen on that side distended visible peristaltic movements. Great rigidity on this side tympanitic. In sac, one small loop of ileum and cecum. In abdomen, portion of ileum 65 cm. long great deal more injected than sac contents. No resection.

(Sultan) At top, inguino-peritoneal hernia present. In two loops of small intestine, third loop in abdomen gangrenous with perforation.

13 (Klauber) Fifty-seven years old. Right-sided inguinal hernia, long standing. Moderate distention, but very painful. In sac, loops, unconnected. Third loop in abdomen, 5 cm. long. Vessels of mesentery thrombosed. Bloody serum in abdomen. Resection. Recovery.

14 (Polya) Age 23. Acute hernia after lifting a heavy object. Right side, scrotal, painful, mass size of man's fist. Operation 10 hours after accident. In sac two loops of gut the tip of the appendix adherent to lower pole of sac. Third loop, which was ileum, in abdomen, greatly more injected than sac contents.

15 (Polya) Sixty-four years old. Four year old right-sided inguinal hernia. Abdomen distended, tender. Distinctly palpable, sausage-like mass to be felt above Poupart's. In sac, cecum and appendix, part of ileum, deeply injected. In abdomen brownish red fluid and loop of ileum gangrenous.

16 (Wistinghausen) Thirty-four years old. Right scrotal, size of 1 fist. Pain on pressure in right lower abdomen, above Poupart's. Sac contained 1 distended blue-red small intestinal loops. Fluid in abdomen. Incarcerated loop, 80 m. long in abdomen, gangrenous. Death.

17 (Wistinghausen) Seventy-two years old. Right-sided inguinal, old standing, large size. Incarcerated 12 hours. Three loops in hernia sac all of different color. Another loop in abdomen gangrenous, and mesenteric vessels thrombosed.

18 (Heiler) Seventy-six years old. Since 5 years ago left-sided inguinal hernia, lately not reducible. Left lower quadrant more tender than right. Rigid, dullness in flank. Two gangrenous loops in sac. In abdomen, third loop, gangrenous. Bloody fluid present. Resection.

19 (Neuman) Seventy-five years, female. Double femoral since 30 years ago. Right side strangulated size child's head. Pain in abdomen. Somewhat distended, soft except right to er quadrant, painful on pressure. Active peristalsis visible. In sac cecum and 1 loop of gut, injected. Fluid in abdomen. Incarcerated loop in abdomen, blue-black twix as long as those in sac.

20 (Takayasu) Boy 7 years old. Right inguinal hernia several years standing. Strangulated several hours, mass size of man's fist in scrotum. Abdomen distended, painful on pressure. In sac, cecum and appendix, deeply injected and distended. Bloody floccular fluid in abdomen. Near hernia oedema 40 cm. long, small intestine blue black. Resection. Death.

21 (Manninger) Fifty-six years. For many years right inguinal hernia. Strangulated 4 hours. Elastic mass in right inguino-scrotal region, not palpable. Lower quadrant of abdomen on this side rigid and extremely painful. In sac, cecum and 5 cm. long ileum. Both considerably injected. Near umbilicus a smaller loop. In abdomen great quantity of bloody exudate and one meter long small intestine gangrenous. Mesenteric thrombosis. Resection.

(De Beule) Right femoral. Resistance in right iliac fossa, great tenderness. Palpable distended loop in abdomen.

23 (De Beule) Right inguinal. Resistance in right iliac fossa and hypogastric region.

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A CONTRIBUTION TO THE STUDY OF PITUITIRIN

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A THE EFFECT OF PITUITIRIN ON NORMAL AND ELEVATED BLOOD PRESSURES

DURING the last year many articles on the use of pituitirin in obstetrics were published especially in Germany and the use of this agent in certain atonic uterine conditions (1) has been widely adopted. In reading these reports one is impressed by the contra-indications to its

use outlined by some and by the indiscriminate methods of administration in the practice of others. Because of the marked rise in blood pressure (2) and the lowering of the pulse (3) observed in animal experiments it was very early advised that pituitirin be withheld in such cases as show arteriosclerosis, elevated blood pressure, valvular lesions of the heart, whether com-

persuaded or not, myocarditis and nephritis, and this advice is frequently repeated. The author has used pituitrin now for a variety of conditions, therapeutically and experimentally during the last thirteen months, and, whenever conditions permitted blood pressure and pulse readings were kept and the by-effects of the therapy were noted. It is the purpose of this paper to record some of the results as influenced by the method of administration and to draw certain conclusions therefrom.

Most of the observations here related were made upon normal women who had already been delivered and, except as specifically noted, no patient who had fever or any of the above-mentioned contra-indications was treated with pituitrin. The dose given in each case was the same—1 cc. of solution containing 1 gram of the posterior lobe of the hypophysis.

Pituitrin was given subcutaneously to seventeen women during the puerperium whose blood pressures ranged from 100 to 134.

None experienced any systemic sensations or showed any peculiar changes at the injection point.

Among those who were treated intramuscularly were eleven whose readings were taken before and for sufficiently long a time after wards. Of these, five showed an increase in blood pressure of from eight to twelve millimeters. The most marked pulse lowering was eight beats to the minute. These reactions appeared within five minutes and were over within fifteen minutes. The rest showed no unusual variations. In none of the eleven were any unpleasant symptoms produced.

In all cases where no reaction was obtained the tension was taken at frequent intervals up to one hour after injection time. In every case where the uterus was palpable it could be felt to harden after the subcutaneous and intramuscular injections.

The following chart records the results of the intravenous injections which were given during an effort to determine the action of pituitrin upon the lactating breast.

Case	No. 1 BP P	No. 2 BP P	No. 3 BP P	No. 4 BP P	No. 5 BP P	No. 6 BP P	No. 7 BP P	No. 8 BP P
Before	118 76	114 66	142 76	130 80	140	116 84	120 68	114 80
3 min.		120 66	100 54	120 60	7 00		128 68	114 64
5 min.	118 66	120 84	70 60	78 66	99 78	140 68	7 72	118 76
10 min.	115 68	118 84	100 72	80 70	144 90	130 74	14 72	123 80
15 min.	112 70	118 90	100 78	140 78	143 96	138 80	3 96	
20 min.	8 74							80
30 min.			145 78	118 82	14 14			
45 min.			140 74	1 80			8 1	

Care was taken to select a place where there would be the least chance of puncturing a vessel. A drop or so of blood escaped upon withdrawal of the needle in two cases, however so that it is possible that in these two some of the fluid was injected into a vessel. One of the two had an increase in pressure of eight points and a fall in the pulse of eight beats, which appeared within five minutes after the injection. The reaction was over within ten minutes and was unaccompanied by any symptoms. In all the other cases there was no variation greater than four points in pressure and six beats in the pulse and the most escaped any change in pulse or pressure.

In case No. 1 there was some difficulty caused by a dull needle, and it was doubtful at the time of injection whether the vein had been well entered. It will be observed that there was less reaction on pulse and pressure produced than in any of the following seven. The patient also escaped all of the symptoms of which the others complained. The injection was without difficulty in the other seven, and in each a well-defined effect was produced—an almost immediate high rise in blood pressure and outspoken slowing of the pulse. Within a minute each appeared bloodless and cadaverous and complained of feeling queer and dizzy as though succumbing to the influence of an anesthetic. These sensations were in every case of short duration and began

Herrell did not obtain any effect on blood pressure after subcutaneous injections of pituitrin.

to disappear as soon as the blood pressure began to lower and lasted in no case longer than three minutes. No patient had any unpleasant after-effects. In almost every case there was a fall of the tension to slightly under normal accompanied by a slightly increased pulse frequency immediately following the pressure rise. This decreased tension lasted but a brief while, though the chart is not instructive regarding the duration.

The symptoms produced in patient No. 3 were rather alarming. Almost immediately upon injection she spoke of feeling 'funny' she became blanched and pinched in appearance felt somewhat nauseated, was anxious, broke out in a cold sweat and really appeared very ill though she complained of no pain. The blood pressure jumped within 13½ minutes from 142 to 200 and the pulse dropped from 76 to 54 and for part of a minute the heart was much slower—ten beats to fifteen seconds. The unpleasant symptoms were synchronous with the rise in blood pressure and began to disappear as the tension decreased. The patient felt entirely comfortable again within fifteen minutes. In all eight cases the uterus gave some evidence of marked contraction either it was palpated as a stone hard ball or the patient had an after-pain, or lochia was felt to escape from the vagina.

The variation noted between the different methods of administration is probably dependent upon the rapidity of the ingress of the blood-pressure-raising substance to the circulation. By the intravenous route the entire amount gains immediate entrance, while by the intramuscular route very often portions are injected into the lumina of small vessels. When given subcutaneously the absorption is slow enough so that the blood pressure is able to maintain its equilibrium.

It has been shown that the rise in blood pressure is due to the contraction of peripheral arterioles, (2) and that the coronaries share in this contraction (4-5). In view of this and of the facts here related concerning normal individuals, the method of administration of pituitrin cannot be a matter of consequence.

The intravenous dose would seem to be

contra indicated in the class of cases mentioned because of the great probabilities of harmful results. The resemblance of the symptoms in normal individuals after the intravenous injection of pituitrin to those seen during an attack of angina pectoris is quite striking. In animals pituitrin causes an increased secretion of urine (6) with vasodilatation of the kidney vessels (7) so that it is doubtful if pituitrin administered to cases of nephritis unaccompanied by increased tension would produce any peculiarly harmful results.

In two cases of compensated valvular heart disease in two of nephritis without high tension and in a case of very high toxic blood pressure where indications for the termination of labor arose while the fetus was still in a difficult position for forceps pituitrin was administered subcutaneously with gratifying results without any demonstrable effect on the circulation.

Because of the possibility of an undiagnosed condition contra-indicating an upright increase in blood pressure and arteriole contraction the intravenous administration of pituitrin is unsuited to routine use and it should be reserved for desperate emergency cases where the immediate action of the extract is highly desirable as in severe postpartum hemorrhage. Where a fairly rapid result is wanted, the intramuscular administration is much safer. For general use the subcutaneous injection should be employed, since it is uniformly without possibilities of harmful blood pressure effects and is as safe as far as the skin is concerned as is the ordinary hypodermic medication.

B THE ACTION OF PITUITRIN ON THE LACTATING MAMMARY GLAND

Ott and Scott (8) found that in a lactating goat the rate of milk flow measured by the insertion of a cannula into the mammary gland was increased one hundred fold by the injection of the extract of the posterior lobe of the hypophysis. The period of the increased rate of flow was short, but could be re-established though to a lesser degree by

Boil thymic trouble might follow subcutaneous injections because of vaso-constriction

a second injection Schiffer and Mackenzie, (9) working with lactating cats obtained the same results. On the basis of these experiments the galactogenic action of pituitary extract was asserted.

In order to test the effect of pituitrin upon the lactation of human mothers, it seemed wisest to experiment with patients who had passed the puerperium. During the first weeks after delivery so much depends upon the general physical and mental condition of the patient that the effect of medication upon milk production is hard to determine with any degree of certainty. Nevertheless, it was felt that something might be learned from patients in the puerperium where there was no child since in them, at any rate, the galactogenic action of the child's nursing could be eliminated. Normally there occurs after abortion or delivery at a variable time from the second to the fourth day the breast reaction which is marked by engorgement of the gland and discomfort or even pain. If nursing or pumping is not permitted, the pain after twenty-four to forty-eight hours abates the reaction disappears and the breast gradually dries up. Assuming that pituitrin stimulates the milk production then it should restate the engorgement and consequent discomfort. If given when the breast reaction is beginning to subside

Two cases that had aborted and two that had given birth to a dead child at or near term were used in this test. The bowels were well evacuated the day following delivery and as soon as the breast reaction occurred cathartics were discontinued, daily cleansing enemas were administered when necessary and the fluid intake limited to one quart a day—these measures being adopted in order that the breasts might be subjected as nearly as possible to constant conditions during the experiment. On the second or third day after the beginning of the reaction when the patient had stated that she had been free of discomfort in the breasts for a period of from six to twelve hours, an injection of pituitrin containing 1 gram of the posterior lobe of the hypophysis to one cubic centimeter of solution, was given. The initial injection was in three

cases intravenous. In two intramuscular and in two subcutaneous. All received a subcutaneous dose on each of the two succeeding days. In six cases the breasts steadily decreased in size and there was no recurrence of discomfort. The pituitrin was to all appearances without influence. In one case there was recurrence of pain in the breasts the night following the first injection. Examination of the history of the patient showed however that in the twenty-four hours preceding the injection of the pituitrin there had been numerous watery defecations, resulting from a saline cathartic prescribed by an interne who was unacquainted with the observations to be instituted while on the day of the injection there had been no evacuation at all. The day following, the patient was again comfortable and the breasts began to decrease in size rapidly in spite of the succeeding doses. Blood pressure readings showed an increase in tension following all the intravenous administrations and after one of the intramuscular injections, while after the subcutaneous doses there was no pressure rise. In this class of cases no galactogenic effect of pituitrin could be demonstrated.

It was then decided to try pituitrin on a few mothers whose infants in consequence of a proved deficiency in breast supply had been for some time upon well-managed supplementary feedings. The accessory feedings were withdrawn and the child was weighed daily as were also four successive feedings, alternating the breasts at three-hour intervals, beginning at the second regular feeding of the day. This routine was continued for two days preliminary to the first injection and a chart was kept. If a child showed a gain in weight or if there was a variation greater than one-half ounce between the feedings from the same breast at a like period on successive days, the case was considered unsuitable for the observation. From the cases which satisfied the requirements four were selected where the mother could be depended upon and the scales were reliable. The children varied from four to eight months in age. After having established an index to the normal secretion in the way mentioned a subcutaneous injection of pituitrin was

given on the third day after the first weighed feeding and a second injection was given at the same time on the next day. It was considered that if an increase of more than half an ounce occurred at any feeding above the normal average for that particular feeding a galactogenic action might be suspected. No unusual variations were observed. All children had to resume supplementary feedings at the end of the observation period. In no case, on the first day of the injection, was there a variation exceeding one half ounce. In one case on the evening of the second day there was an increase of one and one half ounces above the average of the weights for the same breast but the reason ascribed to this was that the preceding feeding of that breast had been cut short one ounce by the arrival of an unexpected visitor. In one case the feedings were somewhat below the average. In this class of cases too it was not possible to demonstrate any galactogenic action of pituitrin.

Although these experiments failed to demonstrate any favorable reaction of pituitrin upon the human milk supply C. B. Reynolds (10) and Scott also (11) reported seemingly beneficial results upon that class of cases which I had refused as open to too many errors and the experiments of Ott and Scott, and Schiller and Mackenzie still seemed to establish a favorable reaction in cases of animal lactation. Unless these results could be explained by some other hypothesis they cast some doubt upon the validity of my own. My familiarity with the well marked and extremely rapid effect of the intravenous administration of pituitrin on the smooth muscle fibers of the uterus suggested to me that the results obtained by the injection of pituitrin in lactating animals might be due to its action on the smooth muscle fibers of the breast, rather than to an increase of the milk secretion.

For the purpose of testing this hypothesis I made a sort of a plethysmograph by connecting a hyperæmia bell with rubber tubing to an upright glass column. The apparatus was applied to the breast, was filled with water

at body temperature and the height of the water column together with its fluctuation due to respiration, noted. If the effect of the administration of pituitrin was to contract the smooth muscle fibers, then the breast would contract and the water in the column descend if however the effect was to increase the secretion in the breast then the breast would swell and the water column ascend.

Five patients from the first week of the puerperium were taken for this observation. In all cases the same dose as before mentioned was given intravenously. Before the administration the blood pressure and pulse were taken, as well as at frequent intervals after the administration. In no case was there a swelling of the gland as interpreted by a rise in the water column. In three cases the effect was to produce a maladjustment of breast and bell so that air rushed into the bell and spoiled the possible effect on the water column. In two cases where the breasts and chests were so shaped that better coaptation was maintained there was a sinking of the water column of one and a half and two inches, respectively beginning within one minute and reaching the maximum fall within five minutes of injection. The water remained at these low levels long after the blood pressure rise which is due to vaso-constriction had subsided. In one case, that of a II-para delivered about 36 hours before where already some milk could be squeezed from the nipple the result deserves a full description. The blood pressure before injection was 114, the pulse was 80 the respiratory excursion of water column was one fourth of an inch. The patient was quiet and at ease. Within thirty seconds after the injection a fine threadlike stream of milk was ejected from the nipple into the clear water surrounding the breast. Corrugation of the areola began within a few seconds and when well marked the stream of milk ceased probably less than one half drachm was ejected. At the same time the water column slowly descended the tube one and one half inches. The patient, like most patients who receive pituitrin intravenously also became blanched and pale she felt dizzy and queer (B. P. 152 P. 64, at 5 minutes and 3 minutes after injection.) Her uneasy sen-

Though it is known that certain hormones such as oxytocin may act very rapidly

should probably be explained by the effect in contracting the smooth muscle fibers of the breast and this very fact makes it probable that its continued administration would discourage rather than stimulate the secretion of milk.

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THREE FINGER FLUCTUATION

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INCLUDING the method it is my purpose to describe there are three ways of testing for fluctuation.

(a) The one-finger method. The student pokes the swelling with his right forefinger.

(b) The two-finger method. This is the method usually taught. The two forefingers are employed one in an active and the other in a passive rôle. With one the swelling is pressed upon, whereupon if fluctuation is present, the other finger is passively elevated. But across the course of a muscle and in fact, this test gives a positive result which only the trained observer can distinguish from real fluctuation.

(c) The three-finger method. This is the one I wish to describe and to recommend. The tips of the two forefingers, and of the middle finger of the left hand are firmly planted upon the swelling, marking out an equilateral triangle of an area rather smaller than the limits of the

swelling. The right forefinger is next sharply pressed into the swelling at right angles to its surface.

Fluctuation is present only if the two fingers of the left hand move away from each other horizontally in the plane of the skin at the moment when this is done. Any movement of the fingers in a vertical direction is to be ignored.

It will be seen that the method consists essentially in the artificial production of a true expansile impulse in an inelastic bag containing fluid. It is evidently not infallible for these conditions may be present to some extent in certain very soft encapsulated tumors.

This three-finger or expansile method of testing for fluctuation effectually distinguishes real fluctuation from the pseudofluctuation of substances such as muscle and fat. I shall be interested to know if such a simple device has occurred to others than myself.

DEPARTMENT OF TECHNIQUE

THE POST-OPERATIVE COMPLICATIONS OF PROSTATECTOMY

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MOST of the data contained in this paper are the result of an experience in prostatic work extending over a period of fifteen years.

There is nothing so instructive to a surgeon as a careful review of his post-operative complications and unfortunate results, as it makes him more careful and lessens the liability of their repetition. It is very pleasant to think only of the good results. When we have a group of cases that do well we begin to feel that we are real surgeons, and it is just at this time that some unfortunate occurrence brings us back to earth again.

The first post-operative complication that we will consider is hemorrhage. This usually occurs in the first 48 hours after operation. It is nearly always of venous origin, and can usually be controlled by pressure. We have had several cases that have had secondary bleeding during the first 36 hours following operation, all of which have been controlled by pressure.

The use of gauze soaked in adrenalin solution if hemorrhage is not controlled by iodoform packing is valuable. One of the times when hemorrhage is liable to occur is when the tube and packing are removed from the perineal wound, all of which can generally be obviated if peroxide of hydrogen be injected into the wound before an attempt is made to remove the gauze. The bubbling of the peroxide loosens the gauze which comes away readily.

In suprapubic prostatectomy the hemorrhage will usually be controlled by packing the capsule with gauze, as it is noted that the capsule immediately contracts down upon the gauze, thereby causing pressure. It is also possible at times to pick up the bleeding point and either ligate or control by forceps. I have recently

had a case in which the hemorrhage was controlled at once by passing a rubber catheter through the urethra, drawing it through the suprapubic wound, tying a knot in the eyed end, wrapping gauze around the knot and catheter shaft so as to form a plug. A silk suture was then passed through the catheter tip and brought out of the suprapubic wound to facilitate its removal. The catheter extending from the penile urethra was drawn forward, a small pad of gauze wrapped around the glans penis, and the catheter held in place by passing a safety pin through it at right angles to the axis of catheter. This patient had had profuse prostatic hemorrhage for ten days, and thus being exsanguinated, it was highly important to guard against further bleeding after the prostatectomy. The packing and catheter were removed in 48 hours, with no return of hemorrhage. Although I have not seen the patient since operation, his convalescence has been rapid. The only fatal case of hemorrhage occurred in a perineal prostatectomy 7 days after operation. The patient was up and about, with no fever and apparently doing well. He sat on the commode to defecate and when he was found by the nurse he had fainted from loss of blood. On my arrival at the hospital the hemorrhage had ceased, but the patient was practically moribund. After transfusion the perineal wound was opened and the clots removed. Although the skin wound was nearly healed, in the deeper tissues there was no attempt at granulation. This patient had very marked arteriosclerosis and this probably accounted for the failure of these reactions as there was no indication of sepsis.

Thrombosis may be one of the unfortunate results of prostatectomy. The only form with

which we have had any experience is the pulmonary. Young has had two cases of sudden death from this complication one immediately following the giving of an enema. I have had one fatal case that occurred five hours after operation. The patient was a man 65 years old, in excellent condition and was one of the simplest cases we have had. He was seen by a resident at 5 o'clock and found to be in good shape at 5:15 he complained of shortness of breath and severe pain in side and coughed up some blood and bloody mucus in ten minutes he died. No autopsy was allowed, but it was unquestionably a case of pulmonary thrombosis.

Pneumonia is a complication, but if care be exercised it is rare. The administration of the anesthetic in these cases is of the utmost importance, and in fact it is almost of more import than the operation. The secret is to just keep the patient under and be ought to be out of the anesthetic before leaving the operating room. Any success we have had in these cases has been due more than any one thing to careful etherization, and during the last few years to the employment of nitrous oxide and oxygen. At best these patients are all old men and supposedly bad cases for an anesthetic. The inverted position of the patient in perineal prostatectomy unquestionably lessens the liability of mucus being carried into the lungs and lessens in that way the liability to inspiration pneumonia.

Sepsis occurs less frequently in perineal prostatectomy than in suprapubic, on account of the drainage afforded by this route. If symptoms of sepsis do occur nothing is so efficacious as salt solution by hypodermoclysis or tap water by Murphy's method in the rectum.

The use of continuous irrigation immediately following operation, both in the perineal and suprapubic routes, is one of our best methods of preventing sepsis and in those cases that give evidence of sepsis, the two-stage operation either perineal or suprapubic with continuous irrigation for even as long as a week before the prostate is removed will unquestionably save cases that otherwise would be lost. In cases of severe infection of the bladder it is well to have made up the time of the operation, or before an utogenous vaccine to help overcome this infection and to lessen the danger of sepsis or the severity of sepsis should it occur.

Anemia is a condition that has to be very closely looked after and preoperative treatment will in large percentage of cases prevent this complication. The phenolsulphthalein test advised by Geraghty is of great importance

in determining the functional activity of the kidney. A large percentage of these cases have diseased kidneys, either chronic inflammatory conditions or chronic suppurative conditions, and the patients to be looked after most carefully are those having large amounts of residual urine as the relief of back pressure in the kidney during the drainage of the bladder makes them especially liable to suppression. If signs of this occur salt solution combined with sweating and other appropriate treatment produces excellent results. Although a good deal is now being written against the use of salt solution, there is no question of its value in these cases, as a large percentage are unquestionably suffering from purulent infections of the kidneys. There is no one thing to which Young attributes his brilliant results more than to the free and oft repeated use of salt solution when indicated.

Patients suffering from diabetes are proverbially bad subjects for operation and are the worst class of cases for prostatectomy. We have lost one case of suprapubic prostatectomy from this complication. The patient 76 years old, had symptoms of diabetic coma before operation, but under large doses of sodium bicarbonate his improvement was very rapid. He did very well for five days after the operation, when marked diminution in the amount of urine secreted was noted the patient became comatose, and there was a marked excretion of acetone the whole room being permeated with this odor.

My fourth death occurred from bichloride poisoning due to an attendant starting a continuous irrigation of 1:1000 bichloride immediately following the operation. This patient developed all the symptoms of bichloride poisoning: spongy gums, fetid breath, profuse diarrhoea, and an acute hemorrhagic nephritis, the urine being made up almost entirely of blood casts. The bichloride continued running in this patient for about 30 minutes. After dressing I went in the ward to see how the patient was doing, and noticed the congealed appearance of the fluid from the outlet tube. On pouring some of the fluid out of the fountain syringe and on tasting it was found to be bichloride. Quarts of salt solution were used to irrigate the bladder but enough absorption had already taken place to produce the marked poisoning already described, from which the patient died.

In the great majority of cases the relief of obstruction is complete if all of the obstructing portion of the prostate is removed. In perineal prostatectomy the operator can never be sure that this is true unless he takes the additional

precaution of passing his finger into the bladder to feel the internal urethral orifice after the prostate is removed. This was painfully brought to mind in one case in which I removed a very large prostate, but left a lobe coming from above the urethral opening that caused practically complete obstruction. It was necessary to perform a second operation from which the patient finally had an excellent result.

(There are some cases that are never able to entirely empty the bladder after prostatectomy where from prolonged distention of the bladder and from prolonged cystitis the contractile power of the muscle is lost because of the infiltration of the muscle with inflammatory tissue. These patients are perfectly comfortable, and have no inconvenience from the ounce or two of residual urine.

The continuation of pus in the urine after prostatectomy is due to three conditions: first, the infected kidneys; second, to a pre-existing cystitis of years duration, where the bladder mucosa is so badly diseased that it never recovers, and third, to the presence of diverticula in the bladder. These patients often experience no inconvenience and can be kept perfectly comfortable with an occasional bladder irrigation. In other cases it is remarkable how a severe preoperative cystitis is perfectly cured by a prostatectomy and the consequent relief of obstruction. In fact some seemingly incurable cases of cystitis have been cured following operation.

Post-operative frequency of urination is due to two conditions: first, contracted bladder, and second, a loss of control. Contraction of the bladder follows a certain percentage of prostatectomies, and can be overcome by careful bladder dilatation under hydrostatic pressure. I have had cases that could hold only three ounces, which by careful dilatation would at the end of three weeks hold as much as twelve ounces.

The cause of the loss of control after perineal prostatectomy is a debatable question. It is unquestionably due to the destruction of the muscle at the neck of the bladder in the prostatic urethra, or in the membranous urethra. I have always used care in preserving the membranous urethra, and have had but two cases that have not eventually recovered from a temporary incontinence. Some cases of perineal prostatectomy are able to hold and void their urine from the time of removal of the tube 24 hours after operation. Some of these patients have to be taught to hold their urine by having regular times to urinate in the same manner in which children are taught. The late Dr. Sam Alexander

of New York had what he called his class in urinary incontinence, in which he filled their bladders with solution, had them pass a certain amount at his command, and cease urinating at the command stop. By this method he has certainly produced some wonderful results.

Injuries to the peritoneum have occurred during both perineal and suprapubic prostatectomy being followed by peritonitis causing the death of the patient. We have been fortunate enough to escape this complication. The complications which have probably brought the most disfavor upon perineal prostatectomy are recto-vesical and recto-urethral fistulae. Unquestionably when these complications develop from tearing of the bladder wall into the rectum and tearing of the prostatic urethra into the rectum, it is usually caused by too rough manipulation and by not separating with care the anterior wall of the rectum from the posterior surface of the prostate before any attempt is made to remove the hypertrophied gland. Care should always be taken after the removal of the prostate to pass the gloved finger into the rectum, to be sure that no tearing of the rectal wall has taken place. Should an opening be discovered it should be sutured at once. Another form of recto-urethral fistula occurs usually during the first week after operation. The cause of this is the necrosis of the rectal wall, due to thrombosis from traumatism. I have had one such case where an opening about the size of a No. 1 French catheter persisted. Ten years ago I had one other case caused by the passage of a rectal tube through the rectal wall into the perineal wound. Young reports two cases breaking down after enema. Recto-urethral fistulae will hardly ever occur in Young's prostatectomy if the levator ani muscles are brought together so as to afford the normal support and protection to the rectal wall. It is only necessary after exposing the posterior surface of the prostate to examine the anterior wall of the rectum with the finger in the rectum to see how thin this tissue is, to realize the amount of care it is necessary to exercise.

Since having this complication we have never permitted the use of a rectal tube or enema on any perineal cases. There are two methods of closing the fistulae, and they both aim at closure of the rectal wound. If one can get either the rectal wound or the urethral wound to heal, of course you can heal the fistula; the urine flowing over the sutures is the complication that causes the infection of the sutures. The methods of obviating this are, first, by directing between

the rectum and the urethra closing the rectal wall by catgut sutures after first freshening the edges of the opening then performing a suprapubic cystotomy so the urine will not escape through the urethra. The suprapubic drainage is kept up for about ten days and the bowels are not allowed to move for a week. The other method is that brought forward by the late Dr. Alexander in which he reports 12 cases successfully treated by the following method. A careful dissection is made between the rectal and urethral walls as in the other method, and the rectal wall is sutured by two rows of sutures. A triangular piece of gauze of about six thicknesses is filled with a 10 per cent solution of iodine and vaseline this is then applied over the anterior surface of the rectal wound, extending to its highest point. The vaseline gauze protects the rectal wound from urinary infection. As the urine escapes from the urethral opening it flows over the vaseline-covered gauze as water runs off a duck's back. This one simple means undoubtedly simplified the treatment of the most distressing complication.

The deposition of calculi in the bladder or prostatic urethra sometimes occurs, those cases which have previously had vesical calculi being most liable to this complication. I have had one case which had a calculus form in the remains of the prostatic urethra. This patient was operated, and a silk traction suture was found that was the nidus of the calculus. He made a perfect recovery and we have never used anything but absorbable suture since even for traction in these cases. We have had one case of bladder calculus following prostatectomy discovered one year after operation the stone was crushed and evacuated the patient has had no recurrence and is well at this time.

Epididymitis is not an uncommon complication and some operators have gone so far as to make section of the vas to prevent it occur more. We have had several cases, but they have all been mild, recovering readily under local treatment and only with the affected organ. I have, however, had one very severe infection that occurred after suprapubic prostatectomy. The patient had a very severe chlamydia infection of the bladder. The epididymitis which developed was followed by large abscesses. Within three days the fluid in the tunica vaginalis became purulent and at operation the tunica vaginalis was found filled with stinking pus of fecal odor. The patient was almost in room in 15 days and made an uninterrupted recovery.

We have noted that some of our cases had

had pain in the urethral canal during the first passage of urine through the normal channel after prostatectomy. In several of these patients the passage of urine has been followed by a typical urethral chill and high temperature. All the cases presenting this latter symptom have had badly infected bladders before operation. It is probable that the first passage of the infected urine through the unhealed urethra causes sufficient traumatism and consequent absorption to produce this condition.

We have had two cases of perineal prostatectomy in which there was a recurrence of obstruction. Care was taken in both cases at the time of operation to be sure every palpable portion of the prostatic growth was removed. One patient had less than an ounce of residual urine immediately after operation after several years this gradually increased to from 4 to 6 ounces, and six years after the prostatectomy he developed complete retention. Cystoscopic examination showed no intra-vesical growth but a median bar could be made out. Operative removal of the obstructing bar was followed by good recovery. The second case operated on five years ago was never completely relieved of residual urine having 3 to 4 ounces after perineal prostatectomy. This patient before operation had had an enormously large fleshy bladder with from 16 to 18 ounces residual urine. The cystoscope showed a left lateral lobe projecting into the bladder but no right lateral lobe. Rectal examination revealed no prostatic tissue. A suprapubic operation was performed and a mass 4 cm. in diameter was removed. This had a dense fibrous capsule with glandular tissue in the center that on section squirted out the milky secretion that is seen in prostatic tissue. My explanation is that small portion of prostatic tissue became surrounded with connective tissue and started to grow thereby causing the obstruction. No evidence of malignancy on section of either of these prostates was seen. Fortunately the second case died four weeks after operation from anuria peritonitis. He was left the hospital a few days being able to void his urine through the normal channel although the suprapubic wound was unhealed. There is probably no operation in surgery that is productive to the patient of more happiness and comfort in the majority of cases than is a properly performed prostatectomy. But I would emphasize the great importance of both the preoperative and post-operative care of these patients. A careful cystoscopic examination will reveal the common any complication and

will often lead him to a different course of pre-operative treatment than if this examination had not been made. It is possible to cystoscope 30 out of every 31 cases of prostatic hypertrophy. I feel convinced that it should always be done when possible, before any attempt at removal of the gland is made for the reason I have just spoken of and for the great assistance it is in allowing a correct diagnosis of the intravesical prostate to be made which cannot be made by rectal examination thereby enabling the surgeon

to choose the operation best suited to the individual case. I believe there is nothing that allows Young to publish his successful results from perineal prostatectomy more than the careful preoperative and post-operative treatment his cases get, and my only criticism of him is that he has not brought this point forward enough, as any ordinary man reading his work would conclude that it is the simplest operation in the world, and all the patients proceed to recovery without any after treatment at all.

INFILTRATION OF LINGUAL NERVE FOR OPERATIONS UPON THE TONGUE AND FOR RELIEF OF PAIN IN INOPERABLE CARCINOMA

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CONFRONTED with a lingual ulcer of eight months' duration and of questionable malignancy in a male patient 42 years of age in which there was pyorrhea alveolaris and slight roughness of the tooth upon which the ulcerated area rested, it was deemed expedient to excise a portion for microscopical examination, but the ulcer was so small (7 mm.) and unaccompanied by palpable lymph-node enlargement that total ablation seemed preferable. It was situated on the right side near the tip. If it were to be excised by the scalpel, the base would have to be seared with the actual cautery to prevent reinnervation of possible cancer cells upon the raw surfaces, as well as to check hemorrhage. This would require thorough local regional anesthesia.

With the recent work upon peripheral nerve infiltrations fresh in mind, it occurred to the writer to infiltrate the right lingual nerve. This nerve can readily be felt as it lies close to the bone beneath the wisdom tooth. A submucous injection at this site of 4 cc. of percent. novocaine and adrenalin 1:3000 induced anesthesia in the distribution of the lingual nerve to the anterior two thirds of the tongue within five minutes. That the needle had entered the nerve was determined by immediate paresthesia and after this the injection was made.

The ulcer was removed by a V-shaped incision without any pain being felt. Its base was cauterized with the Paquelin cautery and all hemorrhage arrested. The patient was naturally alarmed at the sight of the cautery so close to his

face and was nervous during its application, but felt no pain. He did complain slightly of referred pain in the ear but this is not infrequent in peripheral irritation of the lingual nerve, and is explained by its connection with the auriculotemporal. The next day he said he had suffered no pain in the tongue since the operation.

Where can the lingual nerve be reached? It may be felt as cord the size of a matchstick just internal to the pterygomandibular ligament, below and behind the last molar tooth, under the mucous membrane and close to the bone. Project a line from the last molar tooth to the angle of the mandible; the nerve crosses this line one half inch below and behind this tooth. In the aged and in others in whom the wisdom tooth has been shed, allowance must be made for absorption of the alveolar process. Infiltration of mandibular nerve is warranted only where growth destroys landmarks of lingual.

In painful neoplasms in the anterior two thirds of the tongue the suggestion has been made to divide the lingual nerve. In his book Mr. Butlin advises this. No nerve in the body regenerates so rapidly as the trifacial and therefore resection of its branches is being abandoned in favor of alcoholic injection, as recommended by Patrick of Chicago. This method is equally applicable to chronic pain in the distribution of the lingual nerve.

After this article was written case was met with by the author in which alcoholic injection of the lingual nerve seemed well indicated. It

was that of a male aged 77 who 3 months previously noticed a small nodule near the tip of the tongue on the right side. This had increased in size by spreading along the lymphatics toward the base, until at the time of examination, the anterior two thirds of the tongue, together with submaxillary lymph-nodes on both sides, were involved. Operation seemed scarcely justifiable, so that the right lingual nerve was infiltrated with 1 cc. of a solution of 2 per cent. novocaine and adrenalin 1:3000 in 4 cc. of 70 per cent alcohol. In about ten minutes there was complete anesthesia of the right half of the tongue in its anterior two thirds. The following night the patient slept better than for two months and two days later a piece of the growth was painlessly removed for microscopical examination.

In alcoholic injections of nerves information is needed on a point that I have not seen raised. Are the defensive functions of sensory nerves seriously interfered with? For example, the tongue is the watchdog of the digestive tract, and objection to alcoholization of both lingual nerves might be based on the abolishment of tactile and temperature sense, it being conceiv-

able that benign structure of the esophagus might arise from scalds that with the sensitive tongue would not have occurred. Sensibility of the lips, cheeks, palate and teeth however is unimpaired, and, with a word of caution to the patient, will prevent this accident. Therefore, it seems advantageous to infiltrate the lingual alone, instead of its parent stem, the mandibular thereby preserving the sensibility of the lower lip, cheeks and mandibular teeth via inferior dental. What transpires in this respect when Gasser's ganglion is ablated or alcoholized I do not know but I am told that while pain sense is abolished, tactile and temperature sense soon return, at least in part. It must be that the degeneration of a nerve caused by alcoholization is not a true Wallerian degeneration. However corneal ulcers are often sequelae of ophthalmic nerve injury so that it behooves us to be careful in blocking the trigeminal or its branches injudiciously.

Infiltration of the lingual nerve, then, is the method of choice because it is easier, less painful and lasts longer after operation than direct regional anesthesia of the tongue itself.

CONTINUOUS SUCTION AND ITS APPLICATION IN POST OPERATIVE TREATMENT

By JAMES H. KENYON, M. D. New York City

ABOUT six years ago we began using continuous suction in the operating room at the New York Hospital. It proved so satisfactory that soon after its adoption in the operating room we began its employment in the wards and in the private rooms as an aid to post operative treatment.

To obtain the necessary suction continuously and economically we have used an apparatus known in the chemical supply houses as a filter pump, and also a similar device known as a steam ejector. Water or steam flowing through either of these with a pressure of 20 pounds or over will produce sufficient suction.

We have the apparatus connected permanently with the water pipe in the wash room adjoining the ward, and a $\frac{1}{4}$ -inch iron pipe is carried from it through the wall and along the base board, with a valve and hose connection opposite the first

four beds. A stiff rubber tube connects this pipe to a two or a four quart bottle placed under the bed, and from the bottle another somewhat softer tube leads up to the patient.

This method of obtaining suction has many advantages over other devices, as it requires little or no attention beyond turning the water on or off and it is not apt to get out of order.

The application of the suction tube to the region to be drained must be such that there will be no vacuum formed in the wound and no cupping action on the walls or bottom of the sinus. This result is obtained by using two tubes. The outer one, fenestrated and of a diameter and length to fit the sinus, is held in place by a stitch through it and the edge of the wound or better by a safety pin transfixing it near the edge and held against the skin by long narrow adhesive strips a split gauze pad being placed between the skin and the pin. The inner tube must be smaller in diameter so as to permit free circulation of air



Rubber tubes for continuous suction. Dotted lines show relation of inner tube to the outer tube. The inner tube is connected to the suction and is not fenestrated.

1, 2 show snugly fitting rubber cuff on the inner tube. A safety pin through projecting lip of this cuff and the side of the outer tube holds them both in their relation to each other. 4 shows both tubes transfixed with safety pin, without the cuff.

between them and thus prevent a vacuum. It must not extend into the wound as far as the outer one by about half an inch, which result is obtained by a snug fitting, notched, rubber cuff or a transfixed safety pin which rests on the top of the larger tube. This inner tube has only the end opening and is connected to the bottle under the bed.

Another and somewhat simpler method is to take a fenestrated tube suited in size and length to the sinus, place in it the smaller suction tube with its lower end about half an inch above the lower end of the outer tube, and then transfix them both with a safety pin. After sterilizing this double tube arrangement it is inserted into the sinus and held in place by long narrow adhesive strips.

This transfixing of the inner tube with a safety pin or stitch may give rise to leakage and a weakening of the suction, and is therefore not as desirable as the rubber cuff.

A shallow wound or a fecal fistula, where one is endeavoring to hasten healing by strapping and does not wish to introduce a tube into the opening, may be satisfactorily drained and the surrounding skin protected from the irritating discharge by laying obliquely in the depression made by the approximating plaster double tube, as described above, but very short, only one or two inches in length, held in place by adhesive plaster.

The varied applications of this method will readily suggest themselves. For example any deep wound with difficult up-hill drainage where the patient is constantly suffering from wound absorption all cases where the discharge is irritating to the surrounding skin particularly fecal fistulae pancreatic wounds cases in which the discharge is very profuse and the patient made uncomfortable by being continually wet, or is annoyed by frequent dressings.

We have used the continuous section with good results in draining extensive pelvic suppuration following peritonitis in draining deep extra-peritoneal pelvic suppuration following fractured pelvis and lacerated bladder for suprapubic drainage after operations on the bladder removal of new growths, removal of calculi, and prostatectomy. Perhaps the most satisfactory results have been noted in treating fecal fistulae, particularly those cases where the irritating discharge has produced very painful and widespread eczematous condition of the abdominal skin, a few days of the continuous section with a simple dressing generally being sufficient to clear up the skin condition.

As the case under treatment improves the suction may not be required all the time, but its intermittent use will be of benefit. Whenever wounds require irrigating, the application of the suction will render the process much cleaner.

INTRATRACHEAL ETHER ANÆSTHESIA

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DURING the past year I have employed intratracheal insufflation anæsthesia with ether using the Elsberg apparatus, in 84 cases in the ordinary routine hospital service. The most valuable feature of this method lies in the fact that it eliminates any possible anæmia from external respiratory obstruction, thus obtaining an even and sufficient narcosis and an even and sufficient oxygenation of the lungs.

The indications for intratracheal insufflation anæsthesia are thoracic surgery the positive pressure eliminating the danger of pneumothorax when the pleural cavity is opened.

It has not been my good fortune to have been able to employ this method in any case of thoracic surgery except in a number of cases of empyema and lung abscess. In cases of empyema this method permits of partial inflation of the lung thus allowing the surgeon to ascertain if any adhesions are present in the pleural cavity.

In operations about the head, neck, oral and nasal cavities or where obstruction to breathing exists in the upper air passages.

In this field of work it has been most useful to both surgeon and anæsthetist. It keeps the numberist out of the way and, therefore, permits more thorough asepsis of the operation field. The anæsthesia being constant a considerable amount of time is saved, with resultant advantage to the patient. In two cases of suboccipital decompression, for which the patient was placed flat on the abdomen, this method was of particular comfort.

In operations about the neck for which extension of the head is required, such as goiter and resection of glands of the neck where the posture would cause difficult breathing this method eliminates all respiratory obstruction.

In operations about the oral and nasal cavities, the recurrent air stream prevents the aspiration of blood and mucus. Not only does this minimize the danger of aspiration pneumonia, but it also renders the field of operation free of any secretion, and therefore obviates any interruptions in operating.

In a number of cases of intestinal obstruction with fecal vomiting the return current was very effective in preventing the aspiration of throat contents the result of vomiting or regurgitation of stomach contents.

The quiet and even anæsthesia has popularized the method in upper abdominal surgery such as gall-bladder work, and has made the task of the surgeon less difficult. Where the position of the patient makes the administration of an anæsthetic difficult or awkward, I have found this method particularly applicable. For this reason I have employed intratracheal anæsthesia in a number of cases of kidney and ureter surgery.

In feeble and debilitated patients, whose resistance has been lowered by age or disease who have to submit to prolonged or difficult operations, this method of anæsthesia minimizes the operative shock. An insufficient supply of air or over-etherization is hardly possible with this method, and the fact that the patient has to make no effort in breathing relieves all strain on the cardiovascular system.

In my series of cases this method of anæsthesia has proven entirely satisfactory. I have found the method absolutely safe and no harmful consequences have resulted. If certain cardinal principles are adhered to the method is a great deal safer in inexperienced hands than the ordinary methods of anæsthetization. Care must be taken not to introduce the tube beyond the bifurcation of the trachea, into one of the bronchi, the introduction of the tube into the œsophagus, or permitting continued overpressure.

The anæsthesia, as a rule has been light, in fact in a number of my early cases the anæsthesia has been insufficient and in spite of careful manipulation, it was found impossible to cause complete abdominal relaxation to permit thorough exploration. In a few of the abdominal cases the intratracheal tube had to be withdrawn and the anæsthesia continued by one of the ordinary methods. After these experiences I instituted preliminary medication consisting of morphine $\frac{1}{4}$ or $\frac{1}{2}$ with or without atropine in all my cases of intratracheal insufflation anæsthesia, and have not encountered the same difficulties. The operations lasted from 15 minutes to 2 hours. Only a few of the patients complained of pharyngeal or laryngeal irritation as the result of the introduction of the catheter or its presence in these passages, and in none of my series did any pulmonary complications develop.

The pharyngeal irritation occurred in my early cases and was probably the result of my insuffi-

dent experience in the introduction of the tube. Injury to the teeth can be avoided by waiting for sufficient relaxation before attempting the introduction. Vomiting has been a great deal less after this form of anesthesia and never did I see vomiting during the course of the anesthesia. In my series, the patients showed less operative shock than is usual by the ordinary methods of anesthesia, particularly was this impressed upon me in a number of prolonged operations, such as resection of rectum for carcinoma.

In order to fully appreciate the advantages of this method, one must see a case of a plethoric, short necked adipose subject, brought into the operating room with collapsed all nasal, partly cyanotic, labored breathing, with rattling of mucus in the throat, and then note the change that takes place after the introduction of the tube. The color becomes pink, the respirations quiet and easy the pulse steady and of good quality and the mucus is expelled by the return current.

TECHNIQUE OF ADMINISTRATION

I have followed the method as advocated by Elsberg almost entirely.

The patient is first anesthetized by any of the usual methods. It is essential that the patient be fairly well relaxed before the introduction of the tube is attempted. The mouth is then widely opened with a mouthpiece and the head extended by an assistant. I have used the Jackson laryngoscope for the introduction and get a free exposure of the larynx. I have found that by proper extension of the head and by introducing the laryngoscope slightly from right to left, the larynx invariably comes into view. I have used the ordinary silk woven catheter size 22-26 French and I find that the introduction is facilitated by running the catheter through cold water this renders the catheter more firm. Unless this is done, the warmth of the mouth and pharynx has a tendency to soften the catheter and direct it towards the esophagus. When the tube enters the larynx, there is usually a characteristic hissing sound on expiration. This method of intubation has been highly satisfactory in my hands, but I suppose the manner of introducing the tube is a matter of individual skill and preference. Usually when the anesthesia is light a troublesome cough follows after the ether vapor is turned on. This may be overcome by raising the pressure and increasing the strength of the ether vapor. With this apparatus the pressure is always under

perfect control. I gradually raise the pressure to 20 mm. of Hg with a pressure of 20 mm. of Hg, inspiration and expiration will continue, air being inhaled by the side of the tube. In my early cases I would interrupt the current of air and ether which enters the tube a number of times a minute, but I have found that with a pressure of only 20 mm. of Hg it is not necessary to allow the lungs to deflate that often. In number of cases at the request of the surgeon I have raised the pressure to 50 mm. of Hg without any ill effects. It has been my practice to turn the ether vapor on at 100 per cent (according to scale) at the beginning of the operation, and then to gradually reduce the amount of ether vapor to a point where a satisfactory narcosis was maintained. In most cases between 50 and 75 per cent of ether vapor (according to scale) was sufficient to maintain an even and smooth anesthesia. The patients have never been too deeply under the anesthetic and in no instance did I observe dilatation of the pupils as an evidence of too deep anesthesia. At the end of the operation I turn the ether off and allow air to insufflate this hastens recovery from the anesthesia and minimizes the post-anesthetic nausea and vomiting.

SUMMARY OF CASES

Kidney and ureter	8
Head	
Neck	9
Chest	8
Spine	
Abdominal	40
Miscellaneous	6

CONCLUSIONS

1. The greatest field of usefulness of intratracheal insufflation anesthesia is in thoracic surgery.
2. This method is of decided advantage in operations where the anesthetist is in the way or the position of the patient makes the administration of an anesthetic awkward.
3. In cases of obstruction to the upper air passages this method eliminates all the dangers of the ordinary methods of anesthesia.
4. In the aged and feeble the relief of respiratory effort removes the strain on the cardiovascular system and thereby minimizes post-operative shock.
5. The return current of air prevents the inhalation of blood and mucus — this renders operations about the mouth and nose less difficult, — and eliminates a decided factor in the production of aspiration pneumonia.

A SELF-RETAINING RETRACTOR FOR USE IN PERINEORRHAPHY

By LOUIS FRIEDMAN, M.D. NEW YORK CITY

Lecturer in Gynecology, W. Y. Postgraduate Medical School and Hospital; Gynecologist, Harlem Hospital

TO obviate the necessity of retraction by means of bullet forceps or tenaculum held by assistants during plastic work on the vagina, this self retaining retractor was constructed.

The two points corresponding to the position of the carunculae myrtiliformes or the remains of the hymen are caught up by the instrument as shown in the illustration, and by means of the screw the arms are separated to the extent desired, exposing thereby the field of operation so obtaining a steady and equal traction on both sides. As the suturing is proceeded with, traction can be

gradually decreased by a turn of the screw bringing the arms closer together.

The instrument is light but strong, very simple easily worked readily adapts itself to the curve of the buttock so that it is out of the operator's way takes the place of two hands which would otherwise be occupied in doing the retracting by means of bullet forceps, and gives a constant steady exposition of the operative field.

In immediate repair of the pelvic floor following labor, where extra assistance as a rule is limited, this self retaining device is very useful, particularly so where deep and high lacerations in the vagina must be attended to. It can also be used to advantage for retraction in cystocele plastic.

The instrument is 10.5 cm. (4 inches) long, has two curves, the arms separating to the width of 9 cm. (3½ inches) and has a firm bullet forceps catch at the end of each arm.

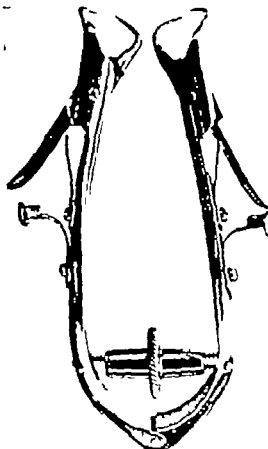


Fig. 1. Friedman self-retaining perineorrhaphy retractor.

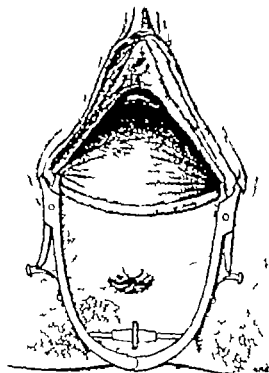


Fig. 2. The vagina retracted and the arms separated.

A METHOD OF VENTROFIXATION COMBINED WITH CERTAIN TUBAL STERILIZATION BY MEANS OF EXTRA ABDOMINAL DISPLACEMENT

By DAVID STETTYN, M. D. NEW YORK CITY

Assistant Teaching Surgeon to the German Hospital, Instructor in Clinical Surgery in Columbia University

IT has been clearly proved by numerous experiments, especially those of Frinkel and Friedmann that single or double ligation of the Fallopian tubes, even with division or resection, is insufficient to positively prevent a subsequent conception. Many clinical reports have corroborated these experimental results, and a large number of more or less complicated and reliable methods have been suggested for the purpose of guaranteeing a certain sterilization.

I have conceived the following plan of combining a simple but infallible method of tubal sterilization with a ventrofixation, where as is generally admitted to-day the prevention of a future pregnancy without castration is frequently indicated, particularly in the more advanced prolapse of younger women. A median laparotomy is performed and the round ligament are ligated about two inches from the uterus. They are divided proximal to the ligatures and freed from the broad ligaments up to the uterine cornua by a few snips of the scissors. The peritoneal edges of the incision in the broad ligaments are united by a running catgut suture. Ligatures are now passed through the broad ligaments between the tubes and ovaries, and the tubes are freed to their uterine attachment. The freed round ligaments and tubes are now brought through a tub wound of the fascia, muscle and peritoneum on either side three quarters of an inch away from the edge of the abdominal incision. They are drawn taut and fixed to the fascia with a catgut suture.

The peritoneum is closed with continuous catgut one stitch passing through the fundus of the uterus, the surface of which has been scarified. The muscle and fascial layers are closed in the usual manner with interrupted chromic gut sutures. If one wishes to be extra certain of fixing the uterus, one or two of the fascial sutures could be passed through the fundus, the peritoneum being left open at this point.

The excess of tubes and round ligaments is removed and the tubes are ligated, the stumps being cauterized with Paquelin. Enough of the tubes and ligament should be left so that they overlap in the median line. They are stitched to the fascia and to the structures of

the opposite side with a few sutures of catgut. The skin wound is closed completely. The various steps in the operation are clearly indicated in the accompanying diagram (Fig. 1).

This method of round ligament fixation is of course a modified Gilliam operation and is substantially the one advocated by McKay. Kelly has adopted the same principle for entrosuspension, omitting the peritoneal uterine suture. It is not necessary here to dwell at length upon its many advantages. It is obviously more reliable than the old fixation methods of simply suturing the fundus to the abdominal wall, where, even if non-absorbable sutures are used, these can easily cut through if there is any tension, and all that holds the uterus in place is an easily stretched adhesion. In this operation in addition to the peritoneal or even fascial adhesion, the round ligaments, derivatives of the uterus itself, become actually incorporated at their strongest portion namely at the uterine cornu into the fascial wall of the abdomen. The division of the ligaments prevents the formation of lateral intra-abdominal foramina, and the peritoneal or fascial stitch to the fundus, besides reinforcing the fixation prevents the formation of a foramen between the tubes and ligaments. I have used the simple fixation in number of cases and it has always proved satisfactory.

The new feature which I am advocating here, namely the drawing of the tubes through the stab wound, has a twofold object. First, it reinforces the round ligament fixation, so that practically the uterine cornua themselves become attached to the abdominal fascia and much the same purpose is accomplished as by Kocher's evolvostomy without the complexity of this latter operation and without disturbing the anatomy of the anterior abdominal wall. Second the lodgment of the distal ends of the tubes outside of the abdominal cavity is an absolutely certain guarantee against conception. Obviously the operation can only be applied to cases in which the tubes are not seriously diseased.

After having performed this combined fixation with sterilization, I discovered that Effers in 1901 reported on a procedure the underlying principle of which is somewhat similar. He describes an

operation for tubal sterilization carried out by Menge and Krönig in which the ends of the tubes are anchored outside of the abdominal cavity through two inguinal incisions, either independent of or combined with an Alexander Adams ventro-suspension. Aside from the disadvantage of bilateral incisions, I feel that in prolapse where a permanent fixation is desired the method that I have described is, for obvious reasons, greatly to be preferred.

As yet I have performed this combined operation in but one case. The patient made a most uneventful recovery and the wound healed by first intention. The scar is solid and the uterus is firmly anchored to the abdominal wall. There has been no pain and menstruation has caused no disturbance.

It has been suggested to me that an infection of the tubes may give trouble. In answer to this argument, I can simply say that I would prefer dealing with a subcutaneous pyosalpinx than with an intra-abdominal one, and I am convinced that the patient would also. The possibility of a tubocutaneous fistula or a hydrosalpinx developing as a result of this extra-abdominal displacement of the tubes can, I think, be disregarded.

It is even conceivable that this method of tubal displacement with or without the round ligament operation might be used for the purpose of

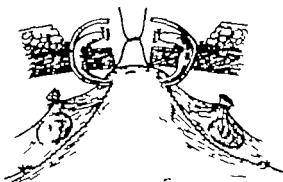


Fig.

producing a temporary sterility. Should for any reason a subsequent pregnancy be indicated the tubes could be replaced into the abdomen. The fimbriated extremity could have been left and even a ligature of the tubes could have been dispensed with at the primary operation. If this eventuality was to be anticipated. If the tube has been ligated, if the fimbriated end has been amputated or if the tube has become occluded, a plastic operation might be attempted to restore the lumen.

TRANSACTIONS OF SOCIETIES

CHICAGO SURGICAL SOCIETY

REGULAR MEETING HELD JANUARY 1 1913 WITH THE PRESIDENT DR. CHARLES DAVISON
IN THE CHAIR

DR. PAUL B. MAGNUSON read a paper entitled
Lengthening Shortened Bones of the Leg by
Operation. (See p. 63.)

DISCUSSION

DR. E. WYLLIS ANDREWS We ought to express our appreciation of this rather valuable and original contribution. I am sure that every one of us will be interested to learn that we have an animal substitute for metallic foreign bodies in bone work just as we have it in catgut or kangaroo tendon for soft parts, something that is better than wire, silk or linen. The writer of the paper through his research, first on animals and then by his later application in operative work, has introduced to a certain extent a new principle. I have been wondering what method of sterilizing ivory was used. I have always looked upon this matter of extending or the lengthening of bones as a sort of bugbear. In all the bone work I have ever done, I have not been able to lengthen the bone in an old fracture which had shortened a few inches, except by extreme force or free cutting. I have not usually been able with several hundred pounds traction with two or three strong men, to pull out a shortened limb quickly. One of my colleagues invented the toggle joint principle in doing this. Supposing it were the femur and shortened a couple of inches, the toggle joint principle gives a tremendous leverage. It is the principle upon which the printing press works. We cut down upon the overlapping fragments. If we angulate sharply as if we were going to reset the ends, these fragments come apart and can be placed together end to end while bent. If one takes the power of leverage by straightening he brings to bear a perfectly enormous pressure or tension or extension-pressure on the ends, on the toggle-joint principle, and in this way the limb can be lengthened in a way in which it could not be by the pull of two or three strong assistants making extension and counterextension. I am

interested to know that even in the human subject three inches of extension can be gotten with a sixty-pound weight. I have not been able to get half an inch of extension when I have cut down upon an old fracture, say three or four weeks old, except by long, hard stretching. I have had a dread of these cases and have planned a different method, cutting through the soft parts where they would be released, at the same time important nerves and vessels not be injured. Perhaps Dr. Magnuson can tell us how one can thoroughly sterilize these plans. The late Dr. Nicholas Senn performed the operation of fixing fracture of the neck of the femur with an ivory peg. I do not remember whether in any of his reports he related how he sterilized the peg, or whether he had to take the peg out or had it disappear by absorption.

DR. WILLIAM HERBERT I unfortunately was not in the room when Dr. Magnuson demonstrated the extension apparatus, and I have had no experience with this apparatus. I have had considerable experience with the Miller-Lemon apparatus, which I like better the more I see of it. This apparatus enables one to operate on fresh cases and old cases with facility and a great deal of overlapping, like these pictures of the femur the doctor showed. From my experience with this apparatus, I cannot conceive of any other appliance that will accomplish the same end results. You can get an enormous amount of traction, as was illustrated in a case that Dr. Harris and myself operated about ten days ago. A man came into the Alexian Brothers Hospital with a compound fracture of both bones of the forearm and a simple supracondylar fracture of the femur. The man developed a case of delirium tremens, and his life was despaired of for while, so when he got so we could do something for his fractures there was considerable deformity. He got union of the femur with three inches of shortening from overlying. Dr. Harris operated and used my apparatus. We were able to get the

fragments, which were united, absolutely solid, in good position, after breaking up the union. The ends were brought in very fine apposition and held there with a Lane plate. I am sure there was a lengthening of three inches without any disturbance to the nerves or disturbance of the circulation. I doubt whether an apparatus of the kind shown by Dr Magnuson would exert a sufficient pressure or pull to bring the fragments of such a case in line.

About the use of ivory screws, I am a bit skeptical. I do not think an ivory screw will hold very much where there is great tension required. It is a good thing I have no doubt, but a metal screw is a good thing when sterilized. It all depends upon the asepsis. If an ivory screw is not aseptic when it is put in, it is going to act like a sequestrum or a foreign body with the formation of serum or pus, or the formation of a sinus within six or eight weeks. It is a matter of asepsis. If the screw is aseptic, it will remain more or less in place although it will cause necrosis surrounding it. But the main point is asepsis. If it is clean it will stay in otherwise it is going to come out, whether it is a screw catgut, or kangaroo tendon.

DR. ARTHUR DEAN BEVAN I want to say a word or two with reference to this apparatus. It has an interesting history. It was the Riddion apparatus long before Lemon made the apparatus, and it has the following history. Some years ago a layman in Boston—I think his name was Bartlett—working with Bradford on dislocations of the hip invented an apparatus for the reduction and dislocation of the hip. That was taken up by Dr. Riddion, and Dr. Riddion developed from that very admirable apparatus of which there are a number in the city of Chicago. Dr. Lemon then saw the Riddion apparatus and modified it. As a matter of fact, the present apparatus which he used for extension belongs to Dr. Riddion, so far as applying it to fractures is concerned. Riddion has a very admirable apparatus. I think there are at least three in the city. I got this straight from Dr. Riddion himself. Recently a meeting was held here of the Orthopedic Society of the Middle West at which the apparatus was shown and this history given. I think we should give credit to our local fellows when they deserve it.

DR. JACOB FRANK I want to express my appreciation and pleasure in having listened to Dr. Magnuson's paper and the very fine work he has brought before us this evening. The work on dogs does not prove that it can be done on the human, as it can be done on the animal. I understand, from the pictures the bone was re-

moved and was merely replaced by another piece of bone, and that the normal leg was stretched beyond its normal length. It is quite a different proposition stretching pathological tissue.

DR. MACGREGOR It was. There was no bone removed but just cut and stretched.

DR. FRANK It is rather strange that the doctor did not do some injury to the nerves or vessels in some of the dogs. In the human we have got to determine first, what is a recent and what is an ancient fracture. If you have a fracture of two years standing, which overlaps two inches or more, I doubt whether it can be replaced as easily as has been demonstrated here. Then another thing, badly united fractures of the humerus, forearm or leg are more difficult to reduce than a fracture of the femur. My experience has been that a fracture of the femur can be reduced easily without any stretching apparatus, especially by the method that Dr. Andrews has described and which Mr. Lane uses, by bringing the proximal and distal ends of the bone in contact, forming an inverted V, the thigh is then straightened, keeping the bones in contact. For some reason this cannot be done as easily with the humerus. While I was in Philadelphia attending the North American Clinical Congress, I remember seeing Dr. Martin use an apparatus with which he tried to pull a badly united fracture of the humerus into place. He tried for at least three quarters of an hour after loosening the fragments, and failed. He kept stretching until he was afraid of doing harm to the vessels and nerves, and discontinued the use of the apparatus. It demonstrated to the audience that if one exerted too much force it would have a bad effect upon the patient's general condition. He got up the reduction with the apparatus and simply sawed off the ends of the bone and united them with a Lane plate. Take an ununited fracture, where there is a loss of bone from a gunshot wound and where there are two or three inches of the bone gone, and the muscles have pulled the ends of the bone together and it has been in that condition for a year or two, I am positive it cannot be lengthened without doing harm to the vessels and nerves. Can we lengthen the muscles, nerves, and vessels two or three inches if the patient has been in that condition for a year or two? I do not think so. I have failed in reducing by pulley and tackle a dislocation of the elbow of five months standing. Force enough was used until I thought I would pull the patient's arm off without any results. I merely cite this to illustrate how difficult it is to lengthen tissues that have become contracted. These

muscles could not be stretched after five months. It seems easy but it is not easily done. Why is the reduction of the femur simpler to reduce than that of the humerus or leg? I have observed this, but cannot give any satisfactory explanation, as the tissues surrounding the bones of the leg and arm are certainly of smaller size than those of the thigh.

With reference to the use of ivory pegs, we all know they have been tried and discarded and that is one of the reasons why the Lane plate came into use. It seems to me it does not matter much whether ivory pegs are made in screw fashion or not, the ultimate result would probably be the same.

DR. MAGNUSON (closing the discussion) I did not for a minute mean to compare this crude arrangement with the arrangement that Drs. Bervan and Hewert spoke of. Those were real stretching apparatuses while this is simply an imitation. This simply consists of a suspender that holds up the pulley and takes what is called a clove hitch around the knee. It has a knot which does not pull tight but does not shut off blood supply but catches above the patella and this answers the purpose very well in the cases I have reported. I have used it several times for other men successfully. Dr. Richter had a case not long ago that we pulled down a couple of inches. He had two cases.

DR. ANDREWS: What bone?

DR. MAGNUSON: The femur. Dr. Phummer's was nine months, with three inches of shortening. I used sixty-five pounds on the fourteen-year-old boy. This apparatus is practically the same thing that Dr. Martin uses except he puts towels and pads around the ends of the fragments.

DR. ANDREWS: How much force or pressure did you use on adults?

DR. MAGNUSON: I used from eighty-five to one hundred pounds and steadily pull seems to bring the muscles down.

DR. WILLIAM FULLER: How long a pull?

DR. MAGNUSON: Until we get what we are looking for.

DR. FULLER: How long does it take?

DR. MAGNUSON: About ten minutes.

DR. HESBERT: How do you judge the amount of traction?

DR. MAGNUSON: You use window weights, and hang the window weights on with hooks, keeping track of the pulsation of the tibial artery, noticing the condition of the circulation and the condition of the patient and so far I have not noticed any bad result from pulling. I do not compare this apparatus with the Ridlon because it is undoubtedly the best apparatus of the kind I ever saw. You can pull a hip right out of the socket or pull the leg right off with it. This arrangement I got up to meet an emergency which is used in our experimental work and Dr. Martin afterwards started using it in the University Hospital and it worked very well. One of my principal jobs as an interne in the University Hospital was hanging on to the foot, trying to pull out the femur and a necessity is the mother of invention. I got this thing up to save a little work.

DR. FRANK: You have seen Dr. Martin work. Did you ever see him fail?

DR. MAGNUSON: Oh, yes. As to sterilizing these ivory screws, we cannot boil them because they warp. I put them in a saturated solution of alcohol and bichloride, put them into the autoclave and sterilize them for an hour in the autoclave with alcohol.

Of course in operating on a fracture we have a different proposition than stretching the leg out where you have a longitudinal incision with nothing to take the strain off the muscles. By this operation you simply have a longitudinal incision with a cross incision at each end. All strain comes on the screws. Every bit of the muscular strain is held by the screw running through the bone. In a fracture, when you get the ends of the bone together, the screw holds it together. When you are going fat bone and pulling the ends apart the strain comes on the screws.

CHICAGO GYNECOLOGICAL SOCIETY

A CLINICAL MEETING WAS HELD AT RUSS MEDICAL COLLEGE JANUARY 17 1913 WITH THE PRESIDENT DR. RUDOLPH W. HOLMES IN THE CHAIR

DR. CARL G. DAVIS read a paper entitled
Review of the Literature and Case Reports of
Ruptured Uterus (See p. 51)

DISCUSSION

DR. N. S. HEANEY The only thing in Dr. Davis' paper that I do not agree with is his advice that after a patient has had one Cesarean section, she should be delivered by version and extraction in case she goes into labor. It does not matter whether the woman is at term or in labor the preferable procedure is to do a section unless the section is contra-indicated by a too advanced progress of birth when first seen.

Another suggestion that occurred to me because of the emphasis placed on ergot as an etiological factor in rupture of the uterus, due to the tetanic contractions from its administration, is that I feel sure that in the near future we will hear of cases of rupture of the uterus produced by pituitrin. In the early reports of the use of pituitrin, it was stated that the contractions produced by it were rhythmic, and not tetanic, but recently we have begun to get reports of adverse conditions produced by the inadvised administration of pituitrin and it has been conclusively demonstrated by the use of a bag inside the uterine canal connected to a recording device that these contractions are not rhythmic, but are tetanic, and that oftentimes the primary contractions will last from fifteen to twenty minutes. The indications for the administration of pituitrin have not been carefully studied, and it is given to too many cases where labor is protracted for other reasons than uterine weakness. Just recently some are beginning to emphasize the point that pituitrin should not be given in cases where there is a dystocia, or given in the first stage of labor but preferably in this stage the patient should be rested instead of the labor pains strengthened by the administration of pituitrin.

DR. FRANK W. LYNN It seems to me that the man who attempts to excise the scar from a Cesarean section will frequently get into trouble. I have had the opportunity of doing secondary sections in four or five cases, and in two of these we studied the scar following the Cesarean section. The scar in two of the cases practically disappeared, so that there was only a faint broken

line of connective tissue. I am quite sure that is what will happen if the case has gone on for a year or two before a second pregnancy ensues. It is true we are to be guided by the site of the scar from adhesions, which are the invariable result, but it is surprising in some cases how faint the adhesions will be if it has been three or four or more years since the first section. I feel there is very little doubt but that the literature shows us that once a case is treated by Cesarean section it should again be so treated. There is no doubt that the great majority of these cases have ruptured from dystocia, largely due to the fact that before the last few years the second test of labor has been desirable, or thought to be desirable, to prove the value or nature of the indication for a cutting operation.

I agree with Dr. Heaney that if version is attempted you subject the woman to the greatest possible risk not only from rupture of the scar or rupture in the weakened area, but from infection when the woman is late in labor and who has had the membranes ruptured, with probably the amniotic fluid drained away as would be expected if there was a primary indication for the Cesarean operation.

DR. MARK T. GOLDSTEIN I was glad to hear a report of these cases of rupture of the uterus. With reference to the conservative and active treatment of rupture of the uterus, I think active treatment is better. It should be the one resorted to. In the cases of rupture of the uterus I have watched treated by others, and that I treated myself under instructions, I recall a few of them in which yard after yard of gauze was packed into a supposed rupture of the uterus, the gauze being packed into the peritoneal cavity and I am firmly convinced did not do well.

A few years ago I reported a case before this society of complete rupture of the uterus (and the specimen is here in Rush Medical College) in which the baby and placenta were delivered in the peritoneal cavity in which I did a radical operation, removed the uterus, and the patient is living to-day. I had four other cases that were treated conservatively and all died. I am positive two of those cases that were treated conservatively might have had better results if treated radically.

A great many ruptures of the uterus in the past have been unnoticed. I recall one case of

rupture of the uterus, but how it occurred I do not know. There was no instrumental work done afterwards, but a laparotomy done two months afterwards showed a rupture in the fundus of the uterus covered over where the omentum was adherent to it.

In regard to the cause of rupture of the uterus, clinically I do not think many of these ruptures occur spontaneously in tonic contraction. I have seen many uteri tonically contracted in concealed accidental hemorrhage. I never saw a uterus rupture that was distended with hydramnios—not that I advocate giving ergot or any other drug to cause tonic contraction. I have gone so far as to say that we should never give ergot in premature detachment of the placenta, but I do not feel convinced that the uterus ruptures spontaneously when it is tonically contracted. You must have rhythmically strong contractions.

I saw one case of spontaneous rupture of the uterus in a multipara with complete rupture into the peritoneal cavity in which the patient was still in the first stage of labor and the cervix would only admit two fingers. A large tear was found the baby was of average size, and the membranes were ruptured. Her uterus was not tonically contracted.

It is very hard to get reliable statistics on rupture of the uterus, because a good many of the cases are not reported, not even the spontaneous ruptures.

DR. W. A. NEWMAN DORLAND. The paper read by Dr. Davis is one of great interest, not only from a statistical point of view but from a clinical standpoint. The cases reported were all desperate ones, and there was nothing to do but to attempt to save life.

I was interested in the treatment of this condition as the result of a case which came into my service at the Philadelphia hospital, a case of cross-birth, in which I permitted the intern, at his request, to do a version. As he extracted the head there occurred a tremendous hemorrhage. I took the case in hand, and on making an examination found a complete laceration on the left side of the lower segment of the uterus, through which I could feel the intestines. I tamponed the cavity and opening and did an immediate abdominal section. I found a tear probably four inches in length in its contracted form, which I closed in a conservative manner by a running suture of catgut and had an excellent result. The patient recovered. At that time I investigated all of the cases in the literature for the two years preceding, 50 cases in all, and I compared the radical with the so-called conservative or

expectant plan of treatment, with the results as given by Dr. Davis in favor of the radical operation. I believe that version is a natural menace in many of these cases. The impaction of the child's head through the contracted cervix is apt to cause a laceration of the lower segment. In my case the laceration was of the lower terete segment extending obliquely up to the upper segment.

The treatment by tampon and expectancy I think should be mentioned only to be condemned. I am not sure but that every case of tear should require a total extirpation of the uterus, but that would depend largely upon the conditions found. If possible, I think the uterus should be saved. I agree with the suggestion that after tear it is safer to follow in a subsequent labor with Cesarean section, in cases that can be closely watched.

DR. RACHELLE S. YABROG. The thing which interests me in the recital of these cases of rupture of the uterus is the obstetrical aspect of them. In my experience in connection with dispensary and hospital work carried on for the purpose of teaching students, which would include probably nearly four thousand cases. I can only recall two cases of rupture of the uterus. The first one, a multipara with two previous normal labors, but the history of a lacerated cervix. Shoulder presentation unrecognized by interns and students for an hour after membrane ruptured. Version was performed with little difficulty and the living child extracted. A severe hemorrhage followed and the patient collapsed. Dr. C. J. Webster saw the case with me very shortly after and confirmed the diagnosis of rupture of the uterus, extending from the cervix deep into the body. He advised packing, and the woman made a splendid recovery. Six months later I could not find any trace of the rupture; the cervix was badly lacerated. She subsequently gave birth to two children. We watched her carefully during the entire pregnancy; the children were small and the labors normal. It seems to me that it would have been

a mistake of judgment to perform a Cesarean section in such a case since the rupture was due to malposition and neglect.

The second case was one that occurred during packing of the uterus for hemorrhage due to stony. As the gauze was being pushed in, the doctor said that he felt a sudden giving way of the uterus. On examination a deep tear extending from the cervix into the body of the uterus, was found. The severe hemorrhage which followed could not be controlled by packing. The woman was in desperate condition but as soon as the

rent was sewed up the hemorrhage ceased and the woman gradually recovered. It seems to me that in dispensary and hospital work, which is carried on for the instruction of the student, whose efforts at diagnosing the position and presentation are made early and where cases are watched by students and internes who have no other demand on their time, cases of rupture are less likely to occur than the work of midwives or private physicians who practice obstetrics as an incidental matter and with whom time counts for too much and effort for a definite diagnosis is seldom made.

DR. J. CLARENCE WEBSTER I am very much interested in the question of rupture of the uterus following Cesarean section. Did I understand you to say Dr. Davis, this case of Dr. Culbertson's was one in which I did Cesarean section years ago?

DR. DAVIS Yes.

DR. WEBSTER But the rupture began about the cervix.

DR. DAVIS The tear extends down across the cervix and from the fundal end of the scar.

DR. WEBSTER On the anterior or posterior wall?

DR. DAVIS On the anterior.

DR. WEBSTER Can you see the old incision?

DR. DAVIS Yes.

DR. WEBSTER I have a specimen of a non-pregnant uterus which I removed for pelvic disease some years after I performed Cesarean section, and all that can be seen of the former scar is a little white line about half an inch long. The wall of the uterus is absolutely normal, and just as thick in front as behind. It is interesting to compare the thin wall of the pregnant uterus with the thick retracted wall found after the *forus* and placenta. If the stitches were applied to the former no change occurring in the wall, it would not be surprising to find a weak scar after the operation. However the thickness of the wall which is stitched amounts to an inch or more and there is a broad area of approximation. In the reduction of the uterus to its normal size there must be a considerable change in the relationship of muscular bundles and fibrous tissue. The original four or five inch incision is marked by a scar one half or three quarters of an inch in length, and this portion of the wall should be as strong as any other.

I believe that the great mass of statistics of rupture of the uterus following Cesarean section belong to the older period of careless sewing and the non-use of catgut so as to get a broad approximation. If there is a gap left in the uterine wall

and pregnancy occurs, the risk of rupture will be great. Sometimes the stitches may cut through the soft musculature or there may be premature absorption of the catgut so that only peritoneal union may be obtained. I would not take the radical position which Dr. Davis and Dr. Lynch have taken, that once a Cesarean section always a Cesarean section. I believe a wiser position would be to say once bony dystocia always a Cesarean section. But if I operated on a woman for some cause as for placenta previa, or an ovarian tumor I would watch her carefully and carry her at least, through the first stage of labor delivering her with forceps, when the head had descended a certain extent. I believe that would be a more conservative procedure than to advocate Cesarean section for every case in which the operation had previously been carried out. Of course, a case in which section had been performed might require the operation again for some cause which did not exist at the first procedure.

DR. FRANK W. LYKCH In my previous remarks I meant dystocia. In thinking over the cases in the past, placenta previa was not an accepted indication, although it is made so now by the recent work of the Berlin School, showing implantation in the cervix, where primary Cesarean section was the method of treatment. A great many of these cases had been tided over to the second stage. If there was some accidental condition, Cesarean section should be performed, and in a subsequent pregnancy if the child was of small size, I would wait. But I do feel that in the cases reported Cesarean section was indicated.

DR. J. CLARENCE WEBSTER It is a very different matter where a rupture of the uterus occurs outside the hospital in the hands of incompetent attendants. In the hospital facilities exist for immediate surgical interference and patients need not suffer from loss of blood due to neglect or delay. Every case of labor in which Cesarean section had been previously employed should be attended in hospital, the operating room being in readiness for an abdominal section if rupture should occur. Under these circumstances the risks would be reduced to a minimum so that we might feel more strongly supported in urging that expectant care in labor should be observed rather than immediate Cesarean section unless there is a very positive indication.

DR. RUDOLPH W. HOLMES Some time ago I reported a case in which I had performed a Cesarean section, indicated by a rupture of the uterus in the previous labor. About two years

previous to the section I was called to a case at the Augustana hospital, in the hands of an outside physician. In the meanwhile the family had called in another obstetrician. On my arrival, the latter already had the abdomen opened. There was a transverse fundal rupture which the operator sewed up. Rupture had occurred in the last expulsive pain for the labor was spontaneous, or else attempt at manual placental removal had done the damage—the placenta was lying loosely in the abdominal cavity. The woman almost died from a double pneumonia, but finally fully regained her health. On her return to the hospital in her next pregnancy I advised and executed the section on account of the previous repaired rupture. On inspecting the old scar there was a softening dimpling at the right extremity of the scar. It is logical to believe the dimpling and softening at this point would be a vulnerable point and probably would give way under the stress of labor.

Many causes have been assigned for the production of rupture of the uterus, but the fundamental one is the ignorance and carelessness of the attendant. One rarely reads of rupture in the hands of the obstetric expert; the cases he has are those brought to the hospital for emergency relief. Obstetric prophylaxis has nearly wiped out the existence of this complication as a primary one in obstetric clinics. This is a question more of the failure to recognize hydrocephalus, minor pelvic contractions, malpositions, etc. I believe Schroeder was right in enunciating the general rule that erosion was contraindicated two hours after the membranes were ruptured. This limitation requires some qualification: one woman may have a premature rupture of the membranes with a quiescent uterus for twenty-four hours in which event the version may be more safely done than in another case with a violently contracting uterus, wetty water and the membranes intact at the time of operation. Fundamentally it is merely a question of the retraction and contraction of the uterus. Further I believe it is an obstetric machinism, to put it mildly to do a version on a dead baby when retraction of the uterus offers the slightest hindrance. There is too much dread among too many physicians to the craniotomies and embryotomies on dead babies, oftentimes these operations are infinitely safer than unscientific versions, brutal prolonged high forceps. I have always felt that Cesarean section once means Cesarean section always. Ninety-six per cent of Caesareans are performed on pelvic indications; therefore in these the indication is always present; here we do not have

extraneous matters to debate. But if a woman came to me with a history of a Cesarean for placenta previa eclampsia, or ovarian cyst, I would hesitate a long time before I would allow her to subject herself to the large potential risks of a rupture with the catastrophe facing her and the baby.

Dr Webster has struck the very keynote in arguing the question. Who knows the technique of the man who performed the previous section? If it were done personally who knows how durable the catgut was, and how active was the phagocytes at the line of incision? If one stitch fails it may mean a marked diminution in the integrity of the whole suture—a gaping occurs—at this point rupture occurs in the next labor. Recently I removed a catgut stitch from the vagina in a woman who had an anterior colporrhaphy performed by me two years ago; apparently there was no attempt by nature to remove this catgut. On the other hand, how often does catgut dissolve too quickly?

The case-vist states that I had delivered one of his cases through the natural channel after a Cesarean; unfortunately I do not recall (nor can I find her record) at the moment of doing this. If so, I may have been ignorant of the fact of her previous history on this point.

I believe the most logical treatment for this complication, complete or incomplete, may be epitomized as follows: Child in utero; head in pelvis, child alive, forceps dead, then craniotomy, transverse presentation, decapitation. If child is in the abdominal cavity partially or wholly then immediate laparotomy. If placenta is in utero remove it manually; if in the abdomen leave until the abdomen is opened, then remove it. If the rupture is a clean-cut one and small sew up; if extensive hysterectomy. The operative course is the best for the abdominal surgeon; on the other hand, the tamponade offers the best course to him who has not hospital facilities at hand and is not versed in abdominal surgery.

Dr Yarrow expressed herself as jamming in the gauze as tightly as possible. I think that is a mistake. I had one case of atony of the uterus in which I as tightly as possible tamponed the cervico-vaginal tract. She had persistent bleeding and nearly died, in spite of the tamponade. Bleeding stopped as soon as the gauze was removed. The overdistention of the uterus prevented retraction, and therefore promoted hemorrhage. I have never heard of this danger and have never seen it in print, but overdistention is dangerous. To jam in gauze in a rupture

may mean an extension of the tear so the work should be done carefully.

DR. GEORGE SCHMAUTZ With regard to scars, referred to by Dr. Webster, he probably knows as well as I do that there have been many cases of Cesarean section performed without sewing the uterus at all, and without getting any trouble. When surgeons started to avoid infection they did so by suturing the uterus with catgut in several layers. Most of the cases of rupture of the uterus after Cesarean section have shown excessive formation of fibrous tissue in the scar and in many of them there was an excessive invasion or formation from the decidua cells in the scar. These things are absolutely naught in the hands of the operator. It is more the fault of the organism of the woman that brings about these conditions. You cannot blame catgut or the man who has operated on them.

DR. ALBERT GOLDBERGER The remarks of the last speaker call to my mind a little argument which I put forth years ago on an entirely different subject, namely that it is not in the power of the operator to determine how strong a ligament he will make when he does ventrofixation of the uterus, as in days gone by. If the ligature is unduly tight, it will cut off circulation, you will not get union no matter how much tissue you tie or sew together. If the ligature is absorbed prematurely that is not in his power or knowledge to control. If the ligature is not perfectly aseptic, or the technique of putting it in is not aseptic, so that slight infection enters, there will be a local emigration of round cells which end in connective tissue and the formation of scar tissue, fibrous tissue, inelastic formation, instead of the normally thick layer of uterine wall that Dr. Webster presupposes is the natural outcome. There are such chances that are scarcely in any operator's control which may happen and invite rupture. In that respect, I cannot exactly agree with Dr. Webster's reasoning.

DR. DAVIS (closing the discussion) In connection with the question of version without rupture and without Cesarean section, Stroganoff takes that up in his article and states that there has been too much stress laid upon the danger of version. He searched through the records of the cases of rupture and found that version was a very rare factor in the causation of rupture. If you are going to consider version without your obstetric teaching, then it should not be attempted then it becomes danger but a version performed early when it is considered good obstetrics, should not cause very many ruptures.

I aimed to be understood with Dr. Webster that if a case came into the second stage, and there was not a question of dystocia, it would be a very easy matter to deliver by version or forceps, whichever one was considered best for that individual case.

In connection with the scar if you are going to attempt to remove the scar, as Dr. Lynch suggested in performing a second section, it would be necessary to make your incision at some distance from the scar to avoid this narrow strip of muscle fibre which probably would not be strong and would be an increased danger in subsequent pregnancies.

EXHIBITION OF SPECIMENS

DR. E. R. LECOURT demonstrated (1) a small ovarian cyst, removed by Dr. Dudley at St. Luke's Hospital, Chicago in which the cyst wall had become converted into true bone with Haversian canals and minute marrow cavities. He referred briefly to other processes of metaplastic bone formation and emphasized the relationship of hemorrhage to the processes. In this ovarian cyst there were no deposits of red blood corpuscle manufacture in the marrow. They have been found in numerous examples of metaplastic bone marrow. The experimental production of bone by processes of metaplasia is readily obtained in the pelvis of the rabbit's kidney by ligating the renal artery. It has also been produced in large arteries by painting the wall of the vessel with silver nitrate.

(2) A large ectopic pregnancy also removed by Dr. Dudley at St. Luke's Hospital. This large ectopic pregnancy gestation having gone on to the end of the eleventh month was removed without rupture of the sac at any point. After fixation in museum fluids the sac was opened by an encircling incision in the middle, and the fetus taken out, when the two halves of the sac maintained their shape much like the halves of a coconut-shell when it is cut open. The patient is still living. The pregnancy of course, is a tubal pregnancy.

(3) Two examples of cyclops. In connection with these malformations, reference was made to the necessity of early thorough embalming in order to make the material available for study of the main problems still connected with malformations. The brain of one of these examples of cyclops has been most carefully examined under the direction of Professor C. Judson Herrick of the University of Chicago. As a result most interesting developments will shortly be published. The other cyclops has not yet been opened.

(4) An example of hernia of the proximal one half of the small bowel into a large duodenojejunal pouch. This specimen was fresh, being removed on the day of demonstration.

REPORTS OF CASES AND DEMONSTRATION OF SPECIMENS

DR. J. CLARENCE WEBSTER: 1. Pregnancy in the right horn of a bicornuate uterus, together with a single large extraperitoneal cyst situated between the vagina and rectum.

The patient was a married woman, aged 37. She was admitted to the Presbyterian Hospital on November 30, 1913, complaining of amenorrhea since August 15th, morning sickness for two months, increase in size of the breasts with tenderness, and abdominal enlargement. On examination a swelling was found in the right lower abdominal quadrant resembling a four months pregnancy. On the left of this swelling was another firmer in character about the size of a two-months' pregnant uterus, connected with the lower part of the larger swelling. The cervix was normal in size, though somewhat softened. The pelvic cavity was almost entirely occupied by another swelling, tense and elastic in character which bulged the posterior vaginal wall downward and the cervix and bladder forward and upward. An abdominal incision was made and the uterus was found to be bicornuate, the right horn being pregnant. The cornua communicated with a single cervix.

The left horn was amputated near the cervix and was found to have a mucosa greatly thickened by decidua formation. The right horn was then opened, the pregnancy removed, and the opening closed with catgut applied in layers. The round and broad ligaments were then stitched to this horn in such a manner as to make it be in the normal position.

Behind the cervix the peritoneum, pushed upwards by the pressure of the pelvic cyst was opened. The cyst was evacuated, its content being a thin, clear fluid. It resembled a simple parovarian cyst and was so firmly adherent to the floor and lateral walls of the pelvis that it could not be safely removed. The edges of the large opening made in it were stitched to the peritoneum and the sac allowed to remain to form the pouch of Douglas. The patient made a good recovery.

2. Multiple fibroids with pregnancy in uterus from which five tumors had been previously removed, together with extensive pelvic peritonitis and inflammation of the appendix, the latter being firmly adherent to the uterus. The

patient, aged thirty-two, had been married nine years. Two years previously five fibroids had been removed in early pregnancy by abdominal section, although she could give no details as to the size and situation of the growths. The operation was followed by abortion after three weeks. On examination an irregular nodular mass occupied the pelvis, extending three inches above the pubes. It was fixed and very tender. The patient had missed three periods. There was constant pain in the lower abdomen, especially on the right side, and marked irritability of the bladder.

Abdominal section was performed. The uterus was enlarged by multiple fibroids and a pregnancy the latter being about three months advanced. One fibroid mass was developing between the bladder and cervix. Another extended into the left broad ligament. Both ovaries, tubes and uterus were buried in adhesions to the sigmoid flexure, omentum, and small intestines.

The appendix was eight inches in length and firmly adherent to the uterus near the right ovarian ligament. Supravaginal panhysterectomy and appendectomy were carried out. The patient made a good recovery.

3. Case of repeated tubal pregnancy

In June, 1910, Mrs. E. aged 30, consulted me complaining of pain in the right side and slight uterine hemorrhage since her last period, four weeks ago. This period was two days overdue. She had suffered from dull pain in the right side for ten years following typhoid. Within the last four weeks it was quite sharp at times.

On examination, the uterus was slightly enlarged, retroflexed, and containing a few small fibroids. There was soft swelling on the right side of the uterus, and the whole right lower quadrant was tender. I advised her to go to the hospital once. However she waited twenty-four hours before doing so. On admission she felt weak and said that she had felt very sharp pains while traveling from her home. Abdominal section was performed. A ruptured right tubal pregnancy was found, considerable free blood was found in the abdomen. The appendix was thickened and adherent. The appendix and right appendages were removed and the round ligaments shortened. The patient made a good recovery.

In November, 1911, the patient again consulted me. She complained of continued slight dribbling of blood since her last period, four weeks ago. This period had been three days overdue. During the past four weeks there had been pain in the

left lower quadrant which was very sharp at times. She stated that her health had been good since her previous operation. I advised her to go to the Presbyterian Hospital. Abdominal section was performed. Some free blood was found in the abdomen. The left tube was pregnant and in progress of aborting through the dilated fimbriated end. The uterus was enlarged and boggy and there were many recent adhesions to it and the left adnexa. The affected parts were removed. The patient made a good recovery.

4. Specimen of a tubo-ovarian cyst. This was removed from a woman, aged 22, married a year and a half and never pregnant. She complained of irregular menstruation since April, 1912, backache, constipation and increase in size of the lower abdomen during the previous eight months. She stated that her health had been good until April, 1912, when the period was four days late.

On examination the uterus was somewhat enlarged. An elastic swelling five inches in diameter was felt in the right lower quadrant. Abdominal section was performed. There was a left hydrosalpinx and enlarged ovary buried in adhesions. On the right side the ovary was normal. The right tube was thick and hard at the uterine end. The outer portion was elongated and distended and communicated at the outer fimbriated end with a thin-walled parovarial cyst which was situated between the folds of the broad ligament, and which contained a thin clear fluid. The left diseased tube and ovary and the right tubo-ovarian cyst were removed. The woman made a good recovery.

The chief interest of this specimen is its rarity. It is common to find tubo-ovarian cysts. Sometimes a tube may communicate with an ovarian hydrocele. The writer has never before seen a tubo-ovarian cyst.

Dr. ALBERT GOLDSPINK. One of the cases reported by Dr. Webster emphasizes the propriety of the removal of the appendix, which should have been done during one of these many operations preceding this. The fact was first emphasized, I believe by Dr. H. Ward Kelly, that even if the appendix appears perfectly innocent and normal, if it is within the reach of the field of operation it should be removed, because it is apt to become entangled with adhesions and then make trouble. I have had two such cases where the appendix was innocent in my judgment and both were operated a emergency cases for virulent appendicitis, one at eight months, and the other at eighteen months after an ordinary abdominal section.

Dr. W. A. NEWMAN DORLAND. Dr. Webster's remarks on repeated extra uterine pregnancy reminded me of the first abdominal section I performed. It was a case of repeated extra uterine pregnancy. Two years after I had helped Dr. Baer to operate on this woman for ectopic gestation I went in upon the opposite side and removed an extra uterine pregnancy. An interesting point about the case was, the woman made her own diagnosis, claiming that she had now the same condition that she had two years before on the other side. There was rupture one week later, at Atlantic City. I operated on her and found the same condition that had been present two years before but on the opposite side.

Dr. CHAS. W. BARRITT. A woman was brought to me about seven years ago from Bristol, Wisconsin, by Dr. Stevens, with a diagnosis of extra-uterine pregnancy. The right tube was removed, and adhesions about the uterus broken up at the time, and the left tube and ovary found healthy. She had been married twelve years. It was her first extra uterine pregnancy on the right side. Four years later she was brought back with the same symptoms. She made her own diagnosis and it was found she had an extra-uterine pregnancy on the left side. This is the only case in which I have operated on both sides.

In regard to appendicitis complicating pregnancy in the last year and a half I have had five cases, the last one at the Cook County Hospital, in which I removed an acute appendix from a woman between seven and eight months pregnant. The appendix was adherent to the posterior surface of the uterus. It was easily freed.

There is one point I would like to call attention to and that is, in dealing with these cases it is almost necessary to make the incision much higher anatomically than is ordinarily for appendicitis, as the appendix is crowded upward and backward at that time. In fact at the time the uterus grows out of the pelvis and begins to grow upward above the pelvic brim, trouble is likely to ensue. This patient had had some symptoms of abortion before the operation was done. She had some contractions but no hemorrhage or dilatation. A few days after operation she aborted or miscarried. The child was alive, and at last accounts it was living. The patient made a good recovery.

In the previous case the patient was between the sixth and seventh month of pregnancy, she had an acute and gangrenous appendix, and the appendix was found flattened out nearly like a leaf in the S-shaped form, the uterus pressing upon it.

so that it was flattened out considerably. That woman had had severe symptoms of abortion in the form of contractions, and by the time she was ready to get up from bed after operation, which was about ten days, she aborted. She made a good recovery.

DR. RACHELLE S. LAROS. I, too, had a case of a woman who made her own diagnosis of extra-uterine pregnancy. She came to me stating that two years before she had been operated on for a left tubal pregnancy and now was only three or four weeks pregnant, but was having the same signs and symptoms. The uterus was somewhat enlarged, there was a little bloody discharge, and a small mass in the line of the right tube. She was complaining of occasional colicky pains on that side. I advised her to let me watch her for a while because I was unable to make a positive diagnosis. Three weeks later I saw her again, the uterus had increased in size, and the mass was decidedly larger. There was a dark, sticky discharge and the patient complained of pain on that side. I advised operation. The family were unwilling to have her operated on, and decided to wait a little while. During the next two weeks she had, off and on, small hemorrhages, and was taken to see one of our best obstetricians. He diagnosed uterine pregnancy, and threatened miscarriage. One night she had quite a severe hemorrhage and was packed for it by his assistant. The patient resented the fact that the doctor did not come himself to attend her and the next morning was brought to the West Side Hospital, and I was again asked to continue the care of the case. I told the patient that I would overlook the discourtesy because I was anxious to establish that my diagnosis was a correct one. The question of a possible uterine pregnancy

besides the extra-uterine, had to be considered now because the patient had lost a good deal more blood from the uterus than I had ever seen in an extra-uterine pregnancy. We decided to curette and removed a good deal of material, indeed, as much as one would expect from a six or eight weeks' pregnancy. But on examination it was found to be entirely of a decidua character and no chorionic villi found under the most careful examination. The mass on the right side was very distinct and again larger than it was at a previous examination. An operation for the removal of the tube was urged, but the husband refused his consent, and the patient passed out of my hands. A month later I obtained the following statement from her friend, which was subsequently corroborated by the patient. That a few days after she left the hospital, she consulted the surgeon who had operated on her for the first extra-uterine pregnancy and he diagnosed salpingitis following curettage which, it is needless to say was not the case. I am glad to say that he did not know that I was her physician when he thus spoke, but he did know that she was taken care of by a woman doctor. The patient disagreed with the surgeon's diagnosis, and insisted that if she were to go to the hospital for treatment, he must call in the hospital gynecologist for consultation—who is, by the way one of our best. The consultant concurred in the diagnosis of salpingitis, and she was put to bed in the hospital and treated accordingly. After remaining there for two weeks, she was pronounced much improved, and was advised to go home the next day. In the middle of the night the doctors were summoned and found the patient in collapse. They operated and removed a right ruptured tubal pregnancy.

BOOK REVIEWS

THE PRACTICE OF OBSTETRICS. Designed for the use of students and practitioners of medicine. By J. CUNNINGHAM, M.D. Fourth edition, revised. Philadelphia. P. Blakiston, Son & Co. 03.

In a work so admirably prepared as this there can be but little to criticize and much to commend. In some respects there is room for difference of opinion, which in no wise impairs the value of the book. As a whole the teaching of obstetrics as exemplified by Dr. Edg. is that endorsed by the leading obstetricians of the world. Some parts of the book merit special mention and commendation, notably such articles as the excellent ones on position in obstetrics and the use of the vaginal and uterine tamponade, the latter a subject frequently slurred or altogether omitted in text-books. The subject of pelvimetry is ably discussed and copiously illustrated.

In common with most conservative surgeons, Dr. Edg. takes a stand against the use of spinal anesthesia as applied to obstetric operations. In the light of the present experience with this method of anesthesia, its use in obstetrics would hardly be justified and might even be regarded as reprehensible. Both ether and chloroform should be considered safer and more convenient in the average case of childbirth.

While not condemning vaginal Caesarean section, he shows the superior merits of the abdominal operation in most cases and especially in instances in which the advocates of the vaginal operation have loudly proclaimed its superiority. The subject of acetonuria in pregnancy is dealt with in a sane and rational manner. The author rightly decries the termination of pregnancy in this condition even when acetone is present in marked quantities, unless other urgent symptoms indicate grave danger should generation be allowed to continue. The grouping and illustrations of the various teratologic conditions are excellent.

Especially attention has been given to the various pathologic features of obstetrics, all of which have been brought thoroughly up to date.

New material in this edition includes such interesting subjects as the vaccine and serum treatment of sepsis, blood-pressure observations, hemorrhage of the new-born infant, pelvimetry of the lower strait (funnel pelvis) and their treatment, pubiotomy, trepanotomical Caesarean section, and the M. M. M. method of treatment for hemorrhage.

The book is a valuable one and well worthy of a place in the library of the accoucheur and gynecologist.

A SYSTEM OF TREATMENT. Edited by Arthur Latham M.A., M.D. F.R.C.P. and T. Crisp English, M.B., B.S., F.R.C.S. Volume IV Obstetrics and Gynecology. New York. The Macmillan Company 1922.

The fourth volume of this system of treatment prepared by many English writers is devoted to the subjects of obstetrics and gynecology and to a general index referring to the entire system. The aim of the volume is to provide the general practitioner with a series of practical articles in as concise form as possible describing the modern methods of dealing with all diseases, and written by those who have had special experience in the subjects with which they deal. So far as the subjects of obstetrics and gynecology are concerned, this aim is excellently carried out in the present volume. The material is arranged with particular reference to therapy, consisting of various series of short articles, rather than chapters each signed by the writer preparing it. The text is clear, the sub-headings are given in broad faced type and throughout there has been an effort toward systematic arrangement. Thus the treatment of the contracted pelvis is handled in a dozen pages. The various degrees of contracture are taken up in separate paragraphs and the rarer forms of contractures discussed separately. Prophylaxis is not forgotten and Prochownick's dietary is briefly set forth. A short list of references closes this theme. This method of course tends to dogmatic expression, the avoidance of which is in some places quite evident and in others leads to uncertainty through too guarded assertion.

Obstetrics is given slightly more space than is gynecology. The general management of pregnancy is first presented, followed by a series of articles on its complications and abnormalities. Besides the commoner conditions such topics are treated of as pendulous belly, uterine and vaginal prolapse, varicose veins, albuminuria, etc. Placenta previa, tubal pregnancy and eclampsia are also included here. The management of normal labor and of labor in special presentations is presented by that master of the Dublin School, E. Hastings Tweedy. The complications of labor, the management and the complications of the puerperium are taken up in turn, followed by topics concerning the new-born child. The technique of obstetric operations is contributed to chiefly by Comyns Berkeley, with the able assistance of Powell, Kerr and Roberts.

The gynecological section of the volume is introduced by Victor Bonney (discusses on general

point in the technique of operative procedures and their after treatment. The Edinburgh school is represented by Halls type of the management of puberty and the menopause. Then comes in order the various gynecologic diseases classified according to the vagina, vagina, uterus, ovaries and ovaries. Disorders of menstruation and of the sexual function treated of briefly as are the diseases of the bladder and rectum. This portion of the work is largely technical, though some space is given to medical gynecology. Brevity is the feature here as is repeatedly demonstrated. Chronic endometritis continues to be a pathological entity and curettage a operation per se. With respect to this procedure the author views rectally not in accord with many British and most American gynecologists.

In imprint the book is excellent and the illustrations while not numerous, are well chosen and to the point. (CAREY CULBERTSON.)

SURGICAL DYS TOXIA. A handbook for students and practitioners. By Prof. Frederick Pels Leusden. English translation by F. von E. Gurdorf M. D. New York, Robson & Company.

This book has many excellent qualities and there will be few persons who are not likely to derive distinct benefit from perusal of its pages. Of course it is not filled with the operations in the priority of which so many American are interested, and those who confine themselves to English and American literature will find that there much has been working along the same lines and that our German colleagues have quite a few opinions of priority. Within the Westphalia May unbrication method for umbilical hernia most markedly and there are numerous other names associated with operations that are missing in this book.

When one reviews a book he should look for the part of the book that are the best and they should be shown as well as possible if the book possesses any merit at all.

One feels that much valuable space and time has been lost in discussing, illustrating and describing so many ligatures that one seldom uses. The operations upon the extremities are clearly illustrated and well described.

In surgery of the head large osteoplastic operations are made everywhere even in the occipital bone here it is not very easy to do. The face operations are the ones usually portrayed in operative surgeries.

In the surgery of the neck and head the indications for operative interference are well made and the operations are clearly described.

In the abdominal and pelvic things (amplified) as are missing but the ideas are good and the surgical technique clearly described. The book may be criticized for the absence of appropriate legends beneath the illustrations, instead of the size of the instruments, etc.

As a whole however it is very instructive and will be of value to get a view that everyone is not portraying.

The author devotes a chapter to anesthetics which is concise and valuable. The chapter upon the division and reunion of tissues would be markedly improved if the nails and plates of same were considered.

SCROTAL OPERATIONS WITH LOCAL ANESTHESIA. By Arthur F. Hertzler M. D. New York, Surgery Publishing Co.

A surgeon who has had a life experience with anesthetics appreciates the great dangers incident to complete narcotics and will therefore feel grateful to Dr. Hertzler for his excellent little manual detailing the technique of local anesthetics in the various parts of the body. It is well illustrated and will be found to be of great value both to those who do little operating and to the general surgeon in special emergencies.

GYNECOLOGY. Vol. IV of The Practical Medicine Series. By Emilius C. Dudley A. M. M. D. and C. von Rachele, M. S. M. D. Chicago: The Year Book Publishers, 9.

This volume of abstract of the most important literature of the year relative to gynecology is presented again under the same authorship as previous collaborations. In general management there is no change the classification responding excellently to the demands of a book of this nature. The various articles summarized are chosen with breadth of view and are condensed with true editorial insight. These abstracts are for the most part concise and systematic, with conclusions in one or three orders whenever possible. Thus the volume comprises a fund of information for the general reader of medicine, for whom, indeed it is primarily published. On the other hand to one who makes an effort to keep in touch at all times with the most advanced work in gynecology it is of interest to peruse this compilation that he may the better measure the relatively little advance that is made in the course of one short year. Certainly it is surprising how many articles or prepared by authors how very writings fail to reveal knowledge of pre-existing literature ideas, or theories. That volume of this nature must be widely inclusive however eyes without argument.

Many of the articles chosen for review are abstracted in detail and elaborated with reproductions of the original illustrations, all of which enhances the value of the material thus prepared. Frequently there is appended to an abstract some trenchant and concise opinion from the pen of the editor, remarks which are always to the point and which bring for the volume additional value to the reader. The book is, of course, uniform in its publication with the other volumes in this series. (CAREY CULBERTSON.)

ANATOMY AND SURGICAL ANATOMY OF THE COELIAC ARTERY AND ITS BRANCHES, THE HEPATIC ARTERY IN PARTICULAR. By Dr P. de Rio-Branco. Paris: G. Steinhilber.

This volume is the result of exhaustive personal research and study of anatomical literature.

It comprises five parts, viz.: 1. The coeliac artery. 2. The coronary artery of the stomach. 3. The splenic artery. 4. The superior mesenteric artery and its branches, normal and abnormal, which anastomose with the hepatic artery. 5. The hepatic artery.

The author reviews the historical development of the regional anatomy as well as the embryonal development of the parts, facilitating the comprehension of the developed vessels and their anomalies. The text minutely describes the relations, size, ramifications and anastomoses not only of the arteries and their branches but of their multiform anomalies as well.

The work stands as a monument to painstaking dissection and comprehensive observation of vast amount of material. H. A. POTTS.

REFERENCE HANDBOOK OF THE MEDICAL SCIENCES.

Vol. I. Third edition, edited by Thomas Lathrop Sedgman. New York: Wm. Wood & Co., 93.

An exhaustive treatise, alphabetically arranged, on the medical sciences.

This is most complete volume and carries the reader as far as bacteriologic technique. It is profusely illustrated, with many excellent illustrations. The articles are written by men high in the profession, and hence are authoritative.

In glancing through the volume the reviewer is struck by the completeness of the articles on surgical anatomy of the abdomen, abdominal injuries, and abdominal tumors. Also by the comprehensive way in which the various diseases, especially skin diseases, are treated.

One is surprised that a book of this magnitude should take up to such an extent the question of bacteriology which begins with a general discussion, then describes each of the pathogenic bacteria and their characteristics. Accompanying this portion of the book are three fine plates showing the various bacteria. Bacteriologic technique is also minutely described.

The book is one that should prove of great value to anyone connected with the practice of medicine, not only from a scientific standpoint but also for general information pertaining to medicine, since biographies are given of those who have attained distinction in the various lines of medical science. Should the remaining volumes be as complete as the first, the Reference Handbook should form a very useful addition to the library of any physician.

CLIFFORD G. GAULIER.

A COURSE IN OPERATIVE SURGERY. A handbook for physicians and students. Second Edition. By Prof. Dr. Victor Schencklen. Leipzig: Johann A. Barth, 93.

The present revised edition contains much which is new and up to date, having six new chapters added, viz.: bone-suture, aspiration of joints, tamponade (Bellocq), extraction of teeth, and extirpation of lingual and cervical glands. The text is profusely illustrated by excellent cuts.

The book is admirably adapted for teaching operative surgery upon the cadaver and is of service as a reference to both graduate and student. A translation in English will soon appear.

H. A. POTTS.

LIFE AND LETTERS OF DR. WILLIAM BEAUMONT. Including hitherto unpublished data concerning the case of Alexis St. Martin. By James S. Meyer, A. B. M. D. with an introduction by Sir William Osler, Bt., M. D. F. R. S. St. Louis: C. V. Mosby Company, 92.

This entertaining and beautifully written biography commemorating the one hundredth anniversary of Dr. Beaumont's entry into the practice of medicine is a fitting tribute to the man who under adverse circumstances was first to study the physiology of digestion and lay the foundation for physiological chemistry in America.

Other biographical sketches have appeared, which have dealt mostly with Beaumont's contributions to medicine but the author discovered two chests containing personal belongings and correspondence which are now in possession of Mrs. Sarah Beaumont Keim, a daughter now living in St. Louis.

From these records and letters, together with other data, especially those on file in the Surgeon-General's Office, the author has compiled an authentic volume which justly portrays the life of the first great American physiologist, a methodical, conscientious, good man, who by his courage of conviction, honesty of purpose and unbiased observations justly earned the veneration of his fellow men.

The book contains many reproductions of his correspondence with noted men of his time, many purely personal, others professional. His detailed records of the gastric fistula and his correspondence with his patient, St. Martin, are entertaining and enlightening in the extreme.

The appendix contains an account of St. Martin's last days which were spent in poverty and want. He died at St. Thomas de Joliette, June 24, 1850, arriving his benefactor and friend 28 years.

References and abstracts of cases of gastric fistula prior to that of St. Martin are also reported.

H. A. POTTS.

LAMENESS AND SURFACE MARKINGS OF THE HUMAN BODY. By L. Bathe Rawling, M. B. B. C. New York: Paul B. Hoeber, 1912.

This volume, appearing in fifth edition, deals with the head and neck, upper extremity, thorax, abdomen, and lower extremity. The figures accurately outline the structures beneath the surface. The text explains the story of the figures gives the various relations of important structures, with directions for calculating their positions relative to the surface markings and bony landmarks, e. g. middle meningeal artery. An appendix gives the length of various passages, tubes, etc., also the weights of some organs. A table giving the generally accepted time of ossification of the epiphyses and of the bones of the upper and lower extremities is also added.

The book will prove useful to teachers and as a reference for the surgeon as well. H. A. POTTS.

THE WASSERMANN REACTION: ITS TECHNIQUE AND PRACTICAL APPLICATION IN THE DIAGNOSIS OF SYPHILIS. By John W. Marchand, B. S., M. D. St. Louis: C. V. Mosby Co., 1912.

The author's purpose in this little volume is to acquaint the student and practitioner possessing certain amount of laboratory training and skill with the precise technique of the reaction giving him complete information as to collection of materials required.

The reaction is clearly and concisely analyzed, complete directions being given for the preparation of hemolysin complement, red blood corpuscles, serum from the patient, antigen, etc.

Results of the reaction in diseases other than syphilis are also discussed. The book is a ready reference for one who has not closely followed the detailed clinical and laboratory development of the reaction. H. A. POTTS.

ELECTRICITY IN DISEASES OF THE EYE, EAR, NOSE, AND THROAT. By W. Franklin Coleman, M. D. M. R. C. S. Chicago: The Comstock-Herald Press, 1912.

In this instance the author has departed from the style usually adopted by writers of text-books on electro-therapeutics with the happy result of producing something interesting as well as instructive. An enthusiastic student of electro-therapeutics, Dr. Coleman has brought within the compass of single volume a wealth of information gathered not only from his own personal experiences and from those of his friends and associates but from an exhaustive search of the literature as well.

The book opens with an introductory section devoted to the physical properties of electricity and the application of electric currents to the treatment of disease. Following this prefatory portion the particular conditions of the eye, ear, nose and throat, in which the various electric modalities have proven of service, are presented.

In his instruction to make the work of practical value to the busy physician the author has been eminently successful. Luck in style there is

complete absence of verbose descriptions or strident theories, instead there is an orderly arrangement of the various pathological conditions, with a clear, clear-cut account of what has actually been accomplished. One who has never employed electro-therapeutic measures in the special fields here embraced will find much that is helpful in affording relief to a class of patients that, under the more usual methods, are almost hopeless. Those already familiar with the subject will find many new uses for this most helpful agent.

On page 301 is an observation on the diagnosis of *Cryptocercus oculi* attributed to *Vincetia*, who made use of both the faradic and direct currents. At the moment of opening the circuit the catode was observed to contract. This statement deserves more than passing notice, as it conclusively establishes the fact that electric currents penetrate the eyeball instead of following path of low resistance around it, and wherever current reaches it is not only capable but actually does perform work. That the reaction was not mere coincidence but as actual result is substantiated by the well-known fact that the protoplasm of all of the lower orders of animal life is extremely susceptible to electrical influences.

The advent of the book is timely for our literature contains little on this particular subject, and that so scattered that it has not been readily available. Undoubtedly much that has been written on electro-therapy has been published in the first enthusiasm of success, and requires a stronger assistant digestion than normal surface but case reports such as are here presented in which all essential data are fully recorded, demand serious consideration. To those of us who have carried to successful termination even single case that without such aid must have ended in failure, the book comes as confirmation of our own experiences, and as an incentive to renewed study of an agent whose power for good is still so little known.

BOOKS RECEIVED

INSURANCE MEDICINE. By Henry H. Schroeder, M. D. New York: Wm. Wood & Co., 1912.

DISEASES OF THE STOMACH. By George Roe Lockwood, M. D. Philadelphia and New York: Lea & Febiger, 1912.

ACCIDENT AND SURGERY TREATMENT. By Edwin Henry Schorer, B. S., M. D. St. Louis: C. V. Mosby Co., 1912.

HYGIENE AND SANITATION FOR NURSES. By George M. Price, M. D. Philadelphia and New York: Lea & Febiger.

THE NARCOTIC DRUG DISEASES AND ALLIED ALLMENTS. By George E. Pettay, M. D. Philadelphia: F. A. Davis Co., 1912.

GENERAL AND SPECIAL PATHOLOGY. By Henry T. Brooks, M. D. Philadelphia: F. A. Davis Co., 1912.

GYNECOLOGICAL OPERATIONS INCLUDING NON-OPERATIVE TREATMENT AND MINOR GYNECOLOGY. By Hiram Hartman, M. D. Philadelphia: P. Blakiston's Sons & Co., 1912.

PREVENTIVE MEDICINE AND HYGIENE. By Miles J. Rosenau, M. D. New York: D. Appleton & Co., 1912.

Clinical Congress of Surgeons of North America

FOURTH ANNUAL SESSION

CHICAGO

NOVEMBER 10 TO 15 1913

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PRELIMINARY CLINICAL PROGRAM

SURGICAL CLINICS

COMMITTEE: A. J. OCHSNER, Chairman, CARL BECK, FREDERICK A. BESLEY and LAWRENCE RYAN

Monday November 10th

A. J. OCHSNER — Augustana Hospital — 8 to
JAMES J. MCGUINN — Columbus Hospital — 1 to 2.
SYLVAN KUNZ — German Hospital — 1 to 2.
BENJAMIN H. BREAKSTONE — Jefferson Park Hospital — 1 to 2.
A. P. HEINECK — Jefferson Park Hospital — 1 to 2.
GILBERT H. WYNEKOOP — Lake View Hospital — 1 to 2.
BENJAMIN H. BREAKSTONE — Malmonides Hospital — 1 to 2.
E. WYLLIS ANDREWS — Michael Reese Hospital — 9 to 10.
EMANUEL FRIEND — Michael Reese Hospital — 9 to 10.
CARL BECK — North Chicago Hospital — 9 to 10.
EMIL G. BECK — North Chicago Hospital — 9 to 10.
Bumouth week only
S. DAHL — Norwegian Desconess Hospital — 9 to 10.
AL. L. HARRIS — Polaknic Hospital — 11.
NORMAN KERR — Polaknic Hospital — 11.
J. R. PENNINGTON — Polaknic Hospital — 10 to 11.
ARTHUR DEAN BEVAN — Presbyterian Hospital — 10 to 11.
G. N. BUSSELY — Ravenswood Hospital — 10 to 11.

G. W. GREEN — Ravenswood Hospital — 8 to 10.
C. G. BUFORD — St. Joseph's Hospital — 9 to 10.
CARL WAGNER — St. Joseph's Hospital — 9 to 10.
W. H. ALLPORT — St. Luk's Hospital — 9 to 10.
T. A. DAVIS — West Side Hospital — 10 to 11.
EDWARD M. BROWN — West Side Hospital — 8 to 10.
T. J. CONLEY — West Side Hospital — 10 to 11.
J. V. FOWLER — Willard Hospital — 10 to 11.

Tuesday November 11th

N. M. PERCY — Augustana Hospital — 8 to 10.
C. G. BUFORD — Children's Memorial Hospital — 9 to 10.
JACOB FRANK — Columbus Hospital — 8 to 10.
C. VOLINT — Columbus Extension Hospital — 9 to 10.
LAWRENCE RYAN — Cook County Hospital — 8 to 10.
A. G. ZIMMERMAN — German Hospital — 9 to 10.
PAUL GRONNERUD — German Hospital — 10 to 11.
C. J. WYNEKOOP — Lake View Hospital — 8 to 10.
BENJAMIN H. BREAKSTONE — Malmonides Hospital — 10 to 11.
E. WYLLIS ANDREWS — Mercy Hospital — 9 to 10.
L. A. GREENSFELDER — Michael Reese Hospital — 9 to 10.
L. L. MCARTHUR — Michael Reese Hospital — 9 to 10.

D. N. EISENDRATH—Michael Reese Hospital—9 to 10
 EMANUEL FRIEND—Michael Reese Hospital—9 to 10
 CARL BECK—North Chicago Hospital—9 to 10
 EMIL G. BECK—North Chicago Hospital—9 to 10
 *Month work only
 WM. R. COBBINS—Post-Graduate Hospital—10 to 11
 DEAN D. LEWIS—Presbyterian Hospital—9 to 10
 GEORGE DE TARNOWSKY—Ravenwood Hospital—8 to 10
 CHARLES H. PARKS—Sheridan Park Hospital—8 to 10
 C. H. MCKENNA—St. Joseph's Hospital—9 to 10
 C. M. MCKENNA—St. Joseph's Hospital—9 to 10
 A. E. HALSTEAD—St. Luke's Hospital—8 to 10
 AXEL WERELIUS—South Shore Hospital—9 to 10
 W. E. SCHROEDER—Weeley Hospital—8 to 10
 F. A. BESLEY—Weeley Hospital—10 to 11
 E. E. HENDERSON—Frances Willard Hospital—10 to 11

Wednesday November 12th

A. G. ZIMMERMAN—Alexian Brothers Hospital—9 to 10
 A. J. OCHSNER—Augustana Hospital—8 to 10
 WM. FULLER—College of P. and S.—10 to 11
 WM. M. HARRIS—College of P. and S.—10 to 11
 CARL BECK—Cook County Hospital—10 to 11
 SYLVAN KUNZ—German Hospital—10 to 11
 B. A. MCDURNEY—Hahnemann Hospital—10 to 11
 J. V. FOWLER—House of Convalescence—9 to 11
 E. E. TORELL—Lake View Hospital—9 to 10
 GILBERT H. WYNEKOOP—Lake View Hospital—10 to 11
 BENJAMIN H. BREAKSTONE—Maimonides Hospital—10 to 11
 J. B. MURPHY—Mercy Hospital—8 to 10
 E. WYLLYS ANDREWS—Michael Reese Hospital—9 to 10
 EMANUEL FRIEND—Michael Reese Hospital—9 to 10
 CARL BECK—North Chicago Hospital—9 to 10
 J. R. PENNINGTON—Polk Clinic Hospital—10 to 11
 WALLACE GROSVENOR—Ravenwood Hospital—8 to 10
 A. G. SCHROEDER—Ravenwood Hospital—10 to 11
 LAWRENCE RYAN—St. Anthony's Hospital—10 to 11
 CARL WAGNER—St. Joseph's Hospital—10 to 11
 A. E. HALSTEAD—St. Luke's Hospital—8 to 10
 CHARLES DAVISON—University Hospital—10 to 11
 A. P. HEINECK—West Side Hospital—8 to 10

Thursday November 13th

N. M. PERCY—Augustana Hospital—8 to 10
 A. J. OCHSNER—College of P. and S.—10 to 11
 N. M. PERCY—College of P. and S.—10 to 11
 JACOB FRANK—Columbus Hospital—8 to 10
 JAMES J. McQUINN—Columbus Hospital—10 to 11
 C. VOLINI—Columbus Extension Hospital—9 to 11
 LAWRENCE RYAN—Cook County Hospital—8 to 10
 E. WYLLYS ANDREWS—Cook County Hospital—9 to 10
 A. P. HEINECK—Cook County Hospital—10 to 11
 A. G. ZIMMERMAN—German Hospital—9 to 10
 PAUL GROSSENER—German Hospital—10 to 11
 H. R. CHILLET—Hahnemann Hospital—10 to 11
 E. E. KAHLE—Hahnemann Hospital—8 to 10
 C. E. WYNEKOOP—Lake View Hospital—8 to 10

BENJAMIN H. BREAKSTONE—Maimonides Hospital—10 to 11
 CARL BECK—North Chicago Hospital—9 to 11
 EMIL G. BECK—North Chicago Hospital—9 to 11
 *Month work only
 WM. F. SCOTT—Oak Park Hospital—10 to 11
 M. L. HARRIS—Polk Clinic Hospital—10 to 11
 NORMAN KERR—Polk Clinic Hospital—10 to 11
 ARTHUR DEAN BEVAN—Presbyterian Hospital—10 to 11
 CARL B. DAVIS—Presbyterian Hospital—10 to 11
 C. N. BUSWELL—Ravenwood Hospital—8 to 10
 C. H. MCKENNA—St. Joseph's Hospital—10 to 11
 C. G. BUFORD—St. Joseph's Hospital—10 to 11
 A. E. HALSTEAD—St. Luke's Hospital—8 to 10
 W. H. ALLPORT—St. Luke's Hospital—10 to 11
 AXEL WERELIUS—South Shore Hospital—9 to 11
 D. A. K. STEELE—University Hospital—10 to 11
 F. A. BESLEY—Weeley Hospital—4 to 6
 PAUL B. MAGNUSON—Weeley Hospital—9 to 10
 H. M. RICHTER—Weeley Hospital—4 to 6
 C. C. ROGERS—Willard Hospital—10 to 11

Friday November 14th

A. G. ZIMMERMAN—Alexian Brothers Hospital—9 to 10
 A. J. OCHSNER—Augustana Hospital—8 to 10
 EDWARD M. BROWN—College of P. and S.—10 to 11
 F. A. BESLEY—Cook County Hospital—10 to 11
 A. E. HALSTEAD—Cook County Hospital—10 to 11
 GEORGE F. THOMPSON—Cook County Hospital—8 to 10
 SYLVAN KUNZ—German Hospital—10 to 11
 GILBERT H. WYNEKOOP—Lake View Hospital—10 to 11
 BENJAMIN H. BREAKSTONE—Maimonides Hospital—10 to 11
 E. WYLLYS ANDREWS—Mercy Hospital—8 to 10
 L. A. GREENSFELDER—Michael Reese Hospital—9 to 10
 L. L. MCARTHUR—Michael Reese Hospital—9 to 10
 D. N. EISENDRATH—Michael Reese Hospital—9 to 10
 EMANUEL FRIEND—Michael Reese Hospital—9 to 10
 CARL BECK—North Chicago Hospital—9 to 10
 J. R. PENNINGTON—Polk Clinic Hospital—10 to 11
 CHARLES J. KOWAN—Presbyterian Hospital—10 to 11
 G. N. BUSSEY—Ravenwood Hospital—10 to 11
 O. W. GREEN—Ravenwood Hospital—8 to 10
 CARL WAGNER—St. Joseph's Hospital—10 to 11
 M. J. SEIFERT—St. Mary's of Nazareth Hospital—8 to 10
 W. E. SCHROEDER—Weeley Hospital—8 to 10
 ALLEN B. KANAVEL—Weeley Hospital—4 to 6
 PAUL B. MAGNUSON—Weeley Hospital—9 to 11
 T. J. CONLEY—West Side Hospital—10 to 11

Saturday November 15th

N. M. PERCY—Augustana Hospital—8 to 10
 F. G. DYAS—College of P. and S.—10 to 11
 JACOB FRANK—Columbus Hospital—8 to 10
 C. VOLINI—Columbus Extension Hospital—9 to 11
 E. WYLLYS ANDREWS—Cook County Hospital—9 to 10
 C. E. HUMISTON—Cook County Hospital—10 to 11

PAUL F. MORF — Cook County Hospital — to 4.
 A. G. ZIMMERMAN — German Hospital — 9 to 11.
 H. R. CHISLETT — Hahnemann Hospital — 8 to 9.
 C. E. KAHLKE — Hahnemann Hospital — 8 to 9.
 C. L. WYNKOOP — Lake View Hospital — 8 to 9.
 H. A. MOJE — Lake View Hospital — to 11.
 BENJAMIN H. BREAKSTONE — Hahnemann Hospital — 1.
 J. B. MURPHY — Mercy Hospital — 8 to 9 to 11.
 CARL BECK — North Chicago Hospital — 9 to 11.
 EMIL G. BECK — North Chicago Hospital — 9 to 11.
 Breakfast work only

S. DAHL — Norwegian Desconess Hospital — 9 to 11.
 PAUL GRONVERUD — Polyclinic Hospital — to 4.
 D. W. GRAHAM — Presbyterian Hospital — 1 to 5.
 W. H. ALLPORT — St. Luke's Hospital —
 AXEL WERELIUS — South Shore Hospital — 9 to 11.
 W. E. SCHROEDER — Wesley Hospital — to 2.

Days and Hours to be Announced

JAMES BURRY — Hook Steel Co. Hospital.
 WILLIAM HESBERT — Alcham Brothers Hospital.
 ARTHUR B. EUSTACE — Post-Graduate Hospital.
 S. C. PLUMMER — St. Luke Hospital.

GYNECOLOGICAL AND OBSTETRICAL CLINICS

COMMITTEE: J. CLARENCE WEBSTER, Chairman, FRANK T. ANDREWS, CHARLES S. BACON, and THOMAS J. WATKINS

Monday November 10th

CAREY CULBERTSON — Cook County Hospital — 8.
 ALBERT GOLDSPOHN — E. surgical Desconess Hospital — 9 to 10.
 HENRY BANGA — Polyclinic Hospital — 9.
 THEODORE J. DOEDERLEIN — German Hospital — 9.
 FRANK T. ANDREWS — Mercy Hospital — 8 to 9.
 EMIL RIES — Post-Graduate Hospital — 9.
 WM. B. FEHRING — Rush Medical College — 1.
 ARTHUR H. CURTIS — Wesley Hospital — 9.
 ROBERT T. GILLMORE — Wesley Hospital — 10.
 MARK T. GOLDSTINE — Wesley Hospital — 10.

Tuesday November 11th

JOHN W. BIRK — Lake View Hospital — 10 to 4.
 CHANNING W. BARRETT — Polyclinic Hospital —

A. B. KEYES — Polyclinic Hospital — 1 to 4.
 CAREY CULBERTSON — Rush Medical College —
 W. M. THOMPSON — St. Joseph's Hospital — 9.
 PHILIP S. DOANE — St. Joseph's Hospital — 10.
 W. S. BARNES — Wesley Hospital — 3.

Wednesday November 12th

HENRY F. LEWIS — Cook County Hospital — 1 to 3.
 LESTER FRANKENTHAL — Michael Reese Hospital — 9.
 FRANK W. LYNCH — Presbyterian Hospital — 1.
 J. CLARENCE WEBSTER — Presbyterian Hospital —
 N. SPROAT HEANEY — Rush Medical College —
 E. C. DUDLEY — St. Luke Hospital —
 MARY G. McEWEN — University Hospital — 9 to 10.
 ARTHUR H. CURTIS — Wesley Hospital — 9.
 MARK T. GOLDSTINE — Wesley Hospital — 10.

Thursday November 13th

CAREY CULBERTSON — Cook County Hospital — 2.
 A. B. KEYES — Cook County Hospital — 1 to 4.
 ALBERT GOLDSPOHN — E. surgical Desconess Hospital — 9 to 11.
 JOHN W. BIRK — Lake View Hospital — to 4.
 FRANK T. ANDREWS — Mercy Hospital — 8 to 9.

C. V. BACHELLE — Polyclinic Hospital — Afternoon.
 HENRY BANGA — Polyclinic Hospital — 9.
 CHANNING W. BARRETT — Polyclinic Hospital —

WM. B. FEHRING — Rush Medical College — 11.
 PHILIP S. DOANE — St. Joseph's Hospital — 10.
 W. S. BARNES — Mercy Hospital — 4.
 ROBERT T. GILLMORE — Wesley Hospital — 9.
 THOS. J. WATKINS — Wesley Hospital — 9.

Friday November 14th

A. B. KEYES — Polyclinic Hospital — 1 to 4.
 CAREY CULBERTSON — Rush Medical College — 1.
 W. M. THOMPSON — St. Joseph's Hospital — 9.

Saturday November 15th

LESTER FRANKENTHAL — Michael Reese Hospital — 9.
 FRANK W. LYNCH — Presbyterian Hospital — to 1.
 J. CLARENCE WEBSTER — Presbyterian Hospital —
 N. SPROAT HEANEY — Rush Medical College —
 THOS. J. WATKINS — Wesley Hospital — 9.

Days and Hours to be Announced

CHARLES S. BACON
 E. S. BAILEY — Hahnemann Hospital.
 HENRY T. BYFORD — West Side Hospital.
 FRANK CAREY
 PETER A. CLARK
 JOSEPH B. DELEE — Mercy Hospital Wesley Hospital.
 W. A. NEWMAN DORLAND
 DAVIS S. HILLIS — Provident Hospital.
 J. C. HOAG — St. Luke's Hospital.
 RUDOLPH W. HOLMES — Angustana Hospital.
 GUSTAV KOLISCHER.
 FRANKLIN H. MARTIN
 B. A. MCBURNEY
 CHARLES E. PADDOCK — St. Luke's Hospital.
 CHARLES B. REED — Wesley Hospital.
 ERNEST SAURENHAUS — West Side Hospital.
 GEORGE SCHLAUCH.
 L. S. SIMON — Michael Reese Hospital.
 HERBERT MARION STOWE.
 BERTHA VAN HOUSEN — West Side Hospital.

GENITO-URINARY SURGICAL CLINICS

COMMITTEE LOUIS E. SCHMIDT Chairman, WM. T. BELFIELD ROBERT H. HERBST GEORGE KOENIGER, VICTOR D. LESPINASSE

Monday November 10th

GUSTAV KOLLSCHER—Michael Reese Hospital—
9 to 12
L. W. BREMERMAN—Office—4 to 6.

Tuesday November 11th

HERMAN L. KRETSCHMER—Alexian Brothers
Hospital—8 to 10.
H. C. CURBUS—College of P and S.—8 to 10.
HARRY A. KRAUS—German Hospital—4 to 5.
L. W. BREMERMAN—Lakeside Hospital—8
ROBERT H. HERBST—Polyclinic Hospital—4 to 6.

Wednesday November 12th

L. E. SCHMIDT—Alexian Brothers Hospital—9 to
F. KREISSL—Jefferson Park Hospital—10 to 12.
GUSTAV KOLLSCHER—Michael Reese Hospital—
9 to 12
L. W. BREMERMAN—Office—4 to 6.

Thursday November 13th

L. W. BREMERMAN—Lakeside Hospital—8
ROBERT H. HERBST—Polyclinic Hospital—4 to 6.
J. S. MAGEL—West Side Hospital—3 to 5

Friday November 14th

HERMAN L. KRETSCHMER—Alexian Brothers
Hospital—8 to 10.
D. V. EISENDRATH and FRENCH S. CARL—Col-
lege of P & S—10 to 12.
HARRY A. KRAUS—German Hospital—4 to 5
F. KREISSL—Jefferson Park Hospital—10 to 12.
LOUIS E. SCHMIDT—Michael Reese Hospital—9 to 11.
H. C. CURBUS—Post-Graduate Hospital—3 to 6
WM. T. BELFIELD—Protestant Hospital—4
L. W. BREMERMAN—Office—4 to 6.

Saturday November 15th

L. W. BREMERMAN—Lakeside Hospital—8
V. D. LESPINASSE—Wesley Hospital—3 to 5

ORTHOPEDIC CLINICS

COMMITTEE E. W. RYERSON Chairman, WALLACE BLANCHARD, CHARLES M. JACOBS, JOHN L. PORTER and HENRY B. THOMAS

Monday November 10th

E. W. RYERSON—Children's Memorial Hospital—
3 to 6 Polyclinic Hospital—10
THOMAS P. LYNAM—Home for Destitute Crippled
Children—1 to 4.

Tuesday November 11th

JOHN L. PORTER—College of P and S.—9 to 11;
Home for Destitute Crippled Children—10
WALLACE BLANCHARD—Home for Destitute
Crippled Children—10 to 4

Wednesday November 12th

E. W. RYERSON—Children's Memorial Hospital—3
to 6, Polyclinic Hospital—10 to 12.
P. MAGNUSON—Home for Destitute Crippled
Children—1 to 4

Thursday November 13th

HENRY B. THOMAS—Cook County Hospital—10
E. W. RYERSON—Home for Destitute Crippled Chil-
dren—10 to 4.

Friday November 14th

WALLACE BLANCHARD—Home for Destitute Crip-
pled Children—10 to 4
E. W. RYERSON—Polyclinic Hospital—10 to 3

Saturday November 15th

C. M. JACOBS—Home for Destitute Crippled Children
—10 to 4

OPHTHALMOLOGICAL CLINICS

COMMITTEE WM. H. WILDER, Chairman, EDWARD V. L. BROWN and CAROL D. WESTCOTT

Monday November 10th

WILLIS O. NANCE—Illinois Charitable Eye & Ear
Infirmary—10.
G. W. MAJONE—Polyclinic Hospital—9.
W. FRANK COLEMAN—Post-Graduate Hospital—4.
WILLIAM H. WILDER—Rock Medical College—10.

Tuesday November 11th

CHARLES H. BEARD—Illinois Charitable Eye & Ear
Infirmary—10.
ALFRED H. MURRAY—Lisle View Hospital—10 to 12.
CHARLES H. FRANCIS—Polyclinic Hospital—9.
GEORGE F. SUKER—Post-Graduate Hospital—9.

Wednesday November 12th

OLIVER TYDINGS — Chicago Eye, Ear Nose & Throat Hospital — to 3.
 J. B. LORING — College of P and S — 3.
 OSCAR DODD — Illinois Charitable Eye & Ear Infirmary — 30.
 S. MEAD HAGER — Polyclinic Hospital — 9.
 W. FRANK COLEMAN — Post-Graduate Hospital — 9.
 GEORGE F. SUKER — Post-Graduate Hospital — 2.

Thursday November 13th

WM. H. WILDER — Illinois Charitable Eye & Ear Hospital — 30.
 G. W. MAHONEY — Polyclinic Hospital — 9.

Friday November 14th

H. W. WOODRUFF — Illinois Charitable Eye & Ear Hospital — 30.
 ALFRED N. MURRAY — Lake View Hospital — to 3.
 CHARLES H. FRANCIS — Polyclinic Hospital — 9.
 W. FRANK COLEMAN — Post-Graduate Hospital — 4.

Saturday November 15th

OLIVER TYDINGS — Chicago Eye, Ear Nose & Throat Hospital — to 3.
 E. V. L. BROWN — Illinois Charitable Eye & Ear Hospital — 30.
 S. MEAD HAGER — Polyclinic Hospital — 9.
 GEORGE F. SUKER — Post-Graduate Hospital —

Days and Hours to be Announced Later

C. GURNEE FELLOWS — Hahnemann Hospital.
 RICHARD J. TIVNEN — Mercy Hospital.
 MORTIMER FRANK — Michael Reese Hospital.
 E. F. SNYDACKER — Michael Reese Hospital.
 BROWN PUSEY — Northwestern University and Wesley Hospital.
 CASEY A. WOOD — St. Luke's Hospital.
 FRANK ALLPORT — St. Luke's Hospital.
 CASSIUS D. WESCOTT — St. Luke's Hospital.
 WM. E. GAMBLE — University Hospital.

LARYNGOLOGICAL AND RHINOLOGICAL CLINICS

COMMITTEE: FREDERICK MENOR, Chairman, WM. L. BALLENGER, and JOHN EDWIN REEDS

Monday November 10th

OLIVER TYDINGS — Chicago Eye, Ear Nose & Throat Hospital — 3 to 6.
 G. W. BOOT — Cook County Hospital —
 STANTON A. FRIEDBERG — Cook County Hospital — to 4.
 CHARLES M. ROBERTSON — Polyclinic Hospital — to 3.
 P. J. H. FARRELL — St. Joseph Hospital — 3 to 5.

Tuesday November 11th

G. W. BOOT — Central Free Dispensary — 2.
 JOSEPH C. BECK — Cook County Hospital — 3 to 6.
 G. W. BOOT — Cook County Hospital — 1.
 OTTO T. FREER — Polyclinic Hospital — 4 to 5.
 CHARLES H. LONG — Post-Graduate Hospital — 3 to 5.
 P. J. H. FARRELL — Sheridan Park Hospital — 4 to 5.

Wednesday November 12th

D. B. HAYDEN — Central Free Dispensary — to 4.
 G. W. BOOT — Cook County Hospital —
 BURTON HASELTINE — Hahnemann Hospital — afternoon.
 OTTO J. STEIN — Post-Graduate Hospital — to 3.
 FREDERICK MENGE — Wesley Hospital — 3 to 5.
 R. H. GOOD — Frances Willard Hospital — 3.

Thursday November 13th

OLIVER TYDINGS — Chicago Eye, Ear Nose & Throat Hospital — 3 to 6.
 G. W. BOOT — Cook County Hospital —
 JOSEPH C. BECK — Cook County Hospital — 3 to 6.

RICHARD H. BROWN — College of P and S — 9 to
 CHARLES M. ROBERTSON — Polyclinic Hospital — to 5.
 CHARLES H. LONG — Post-Graduate Hospital — 3 to 5.
 P. J. H. FARRELL — St. Joseph Hospital — 3 to 5.

Friday November 14th

G. W. BOOT — Central Free Dispensary — 2.
 D. B. HAYDEN — Central Free Dispensary — to 4.
 G. W. BOOT — Cook County Hospital — 1.
 STANTON A. FRIEDBERG — Cook County Hospital — 4 to 4.
 OTTO T. FREER — Polyclinic Hospital — 4 to 5.
 WM. L. BALLENGER — College of P and S — to
 GEORGE E. SHAMBAUGH — Rush Medical College, Seash Hall — 2 to 4.
 P. J. H. FARRELL — Sheridan Park Hospital — to 4.

Saturday November 15th

GEORGE W. BOOT — Children's Memorial Hospital — 3 to 6.
 JOSEPH C. BECK — Cook County Hospital — 3 to 6.
 G. W. BOOT — Cook County Hospital —
 CHARLES H. LONG — Post-Graduate Hospital — 3 to 5.
 ARTHUR M. CORWIN — West Side Hospital — 3 to 5.

Days and Hours to be Announced Later

FRANK E. BRAWLEY — St. Luke's Hospital.
 J. T. CAMPBELL — Post-Graduate Hospital.
 G. J. DENNIS — Wesley Hospital.

MORTIMER FRANK — Michael Reese Hospital.
 T. M. HARDIE — St. Luke's Hospital.
 J. HOLINGER — St. Elizabeth's Hospital.
 E. F. INGALLS.
 HARRY KAHN — Michael Reese Hospital.

O. H. MACLAY — Wesley Hospital.
 GEORGE P. MARQUIS — St. Luke's Hospital.
 JOHN E. RHODES — Presbyterian Hospital.
 ROBERT SONNENSCHNEIN — Rush Medical College.
 C. B. YOUNGER — Wesley Hospital.

OTOLOGICAL CLINICS

COMMITTEE: NORVAL H. PIERCE, Chairman, J. HOLINGER and GEORGE E. SHAMBAUGH

Monday November 10th

OLIVER TYDINGS — Chicago Eye, Ear, Nose & Throat Hospital — 3 to 6.
 G. W. BOOT — Cook County Hospital — 1.
 IRA FRANK — Michael Reese Hospital — 9.
 JOSEPH BECK — North Chicago Hospital — 3 to 6.
 J. GORDON WILSON — Northwestern University Medical School — 10.
 J. HOLINGER — St. Joseph's Hospital — 9.
 T. MELVILLE HARDIE — St. Luke's Hospital.

DAVID FISKE — Children's Memorial Hospital — 1 to 3.
 JOSEPH BECK — Cook County Hospital — 3 to 6.
 G. W. BOOT — Cook County Hospital — 1.
 ALFRED LEVY — Hahnemann Hospital — 70.
 CHARLES M. ROBERTSON — Polyclinic — 30.
 IRA FRANK — Michael Reese Hospital — 9.
 J. HOLINGER — St. Joseph's Hospital — 9.
 A. H. ANDREWS — Wesley Hospital — morning.

Tuesday November 11th

G. W. BOOT — Central Free Dispensary — 2.
 G. W. BOOT — Cook County Hospital — 1.
 JOSEPH BECK — County Hospital — 3 to 6.
 H. H. BOETTCHER — Illinois Eye and Ear Infirmary — 2.
 DAVID FISKE — Polyclinic — 30.
 FRANK ALLPORT — St. Luke's Hospital — 2. General eye, ear, nose and throat clinic.

Friday November 14th
 G. W. BOOT — Central Free Dispensary — 2.
 W. A. BALLENGER — College of P. & S. — 10 to 12.
 G. W. BOOT — Cook County Hospital — 1.
 H. H. BOETTCHER — Illinois Eye and Ear Infirmary — 2.
 JOSEPH BECK — North Chicago Hospital — 3 to 6.
 DAVID FISKE — Polyclinic — 30.
 GEORGE E. SHAMBAUGH — Rush Medical College, Sans Hall — 1 to 4.
 FRANK ALLPORT — St. Luke's Hospital — 2. General eye, ear, nose and throat clinic.

Wednesday November 12th

J. HOLINGER — Alcedon Brothers Hospital — 9.
 JOHN A. CAVANAUGH — Chicago Eye, Ear, Nose and Throat Hospital — 3 to 6.
 G. W. BOOT — Cook County Hospital — 1.
 NORVAL H. PIERCE — Illinois Eye and Ear Infirmary — 2.
 JOSEPH BECK — North Chicago Hospital — 3 to 6.
 O. J. STEIN — Post Graduate Medical School — afternoon.
 FRANK ALLPORT — St. Luke's Hospital — 2. General eye, ear, nose and throat clinic.

Saturday November 15th
 J. HOLINGER — Alcedon Brothers Hospital — 9.
 JOSEPH BECK — Chicago Eye, Ear, Nose and Throat Hospital — 3 to 6.
 JOHN A. CAVANAUGH — Chicago Eye, Ear, Nose and Throat Hospital — 3 to 6.
 GEORGE W. BOOT — Children's Memorial Hospital — 30.
 G. W. BOOT — Cook County Hospital — 1.
 NORVAL H. PIERCE — Illinois Eye and Ear Infirmary — 2.
 J. GORDON WILSON — Northwestern University Medical School — 10.

Thursday November 13th

OLIVER TYDINGS — Chicago Eye, Ear, Nose & Throat Hospital — 3 to 6.

ORAL SURGICAL CLINICS

COMMITTEE: T. UMAN W. BROPHY, Chairman, THOMAS L. GILMER, and Wm. H. G. LOGAN

Days and Hours to be Announced Later

THOMAS L. GILMER — St. Luke's Hospital and Northwestern University Dental School.
 ARTHUR D. BLACK — St. Luke's Hospital and Northwestern University Dental School.
 Wm. H. G. LOGAN — Frances Willard Hospital.

TRUMAN W. BROPHY — Presbyterian Hospital and Frances Willard Hospital.
 HERBERT A. POTTS — Northwestern University Dental School.
 FREDERICK B. MOOREHEAD — Presbyterian Hospital.

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LATERAL CURVATURE

B. EDVILLE GERHARDT ABBOTT A. M. D. PORTLAND, ME.

GENERALLY speaking deformities may be divided into two groups: first, those in which there is a focus of disease in some of the structures entering into the distortion; second, those in which the parts are simply twisted or displaced.

The methods of treatment in each of these two groups differ so widely one from the other that the mistake of substituting what would be efficient in the former for that of the latter or vice versa, would result in an increase of the deformity or perhaps fatally.

For example, in tuberculosis of the cervical spine the accepted treatment is long fixation in as favorable position as can be maintained every effort is directed toward preventing motion. In wry neck, a deformity involving the same structures, treatment is applied for the purpose of establishing normal motion.

It is one of the deformities of the second group that we have under consideration, i.e. a deformity in which there is no focus of disease in any of the anatomical parts entering into it, one in which the structures are simply twisted, displaced and distorted, namely that of scoliosis or lateral curvature of the spine.

There are two fundamental principles governing the treatment of this class or group of deformities which must be applied if one is to expect good results: first, the

deformity must be over-corrected; second, it must be held in the over-corrected position until the distorted parts—muscles, bones and ligaments—have changed from the pathological to the normal.

Let us consider these principles briefly in order to understand why it is necessary to apply them.

From an orthopedic point of view, the individual must possess the ability to place the different parts of the body in any of the various positions which the normal person is capable of doing. Any restriction of these normal limits of motion causes deformity.

There are parts of the body in which loss of these normal limits of motion is followed by a deformity that is not only disabling but unsightly. For instance, if the motion of abduction and flexion in the foot is lost, a club-foot develops.

The spine in many ways is not unlike the foot in its movements, and if for any reason the normal limits of motion are restricted, distortion follows. The normal spine is capable of assuming postures opposite in direction with equal ease and any condition which prevents this flexible body from bending just as far to one side as to the other crooks it.

In the erect position the normal spine is straight when viewed antero-posteriorly, but it bends with equal ease just as far to the

Read before the Third Clinical Congress of Surgeons of North America, New York, Oct. 1-5, 1911.

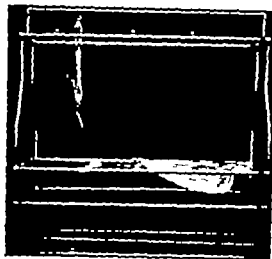


Fig. 1. Bracket frame with superstructure added.

right as to the left and if for any reason motion either to the right or left is restricted it soon habitually assumes a position midway between the erect and that of the limit of motion to one side. In other words, a lateral curve develops.

It is apparent then, that in such parts of the body as the foot and spine unless these normal limits of motion are present deformity will develop.

It is also perfectly obvious that in the correction of such deformities as club-



Fig. 2. Hammock cut diagonally across width.

foot and scoliosis the same laws that govern their development control their reduction.

Referring again to the foot for an example if a club-foot be operated upon and be brought to the correct anatomical position, i.e. a position of flexion to right angle with the leg and to a point midway between abduction and adduction the operation is a failure. On the other hand if after operating the surgeon place the foot in the position of extreme flexion and abduction i.e. in a position exactly opposite to the original deformity the operation should be successful. In other words the club-foot must be first over-corrected.

A successful final result depends, however, on something more than the operation plus an over-corrected position. The foot must not only be placed in this over-corrected position but it must be held and used there.

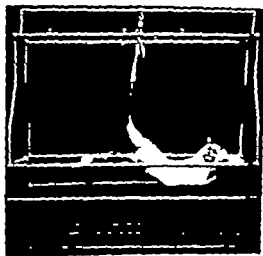


Fig. 3. Patient placed on frame in position of flexion.

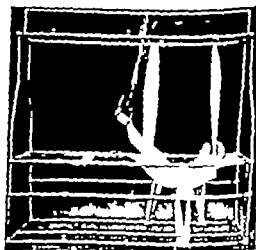


Fig. 4. Showing traction straps attached to hammock.



Fig. 5. Showing traction straps attached to indoles.



Fig. 6. Showing traction straps attached to indoles.

until the parts have changed from the pathological to the normal.

So in lateral curvature of the spine or scoliosis, the deformity must first be over corrected and then held in this position for a considerable period until the structures have regained their normal shape and functions.

The deformity of lateral curvature in its first stages is an easily defined position. It is a normal physiological position one which may be and is assumed by the individual frequently during the ordinary activities of every day life. It is the position of flexion plus lateral bending plus rotation of the bodies of the vertebrae toward the convexity of the lateral curve. In this position one shoulder is elevated the other depressed and the pelvis may be tilted on its vertical axis. The posture is frequently assumed when a person becomes over tired or when performing some kinds of labor and is commonly found in school children sitting in a faulty position at a desk.

The position having been found in which a lateral curvature develops, or in which it may be created it is obvious if the foregoing con-

Y. M. J. June



Fig. 7. Showing indole cut over formerly depressed ribs.



Fig. 8. Windows cut for the insertion of left to make lateral pressure.



Fig. 9. Window cut for the insertion of left to remove rotation.

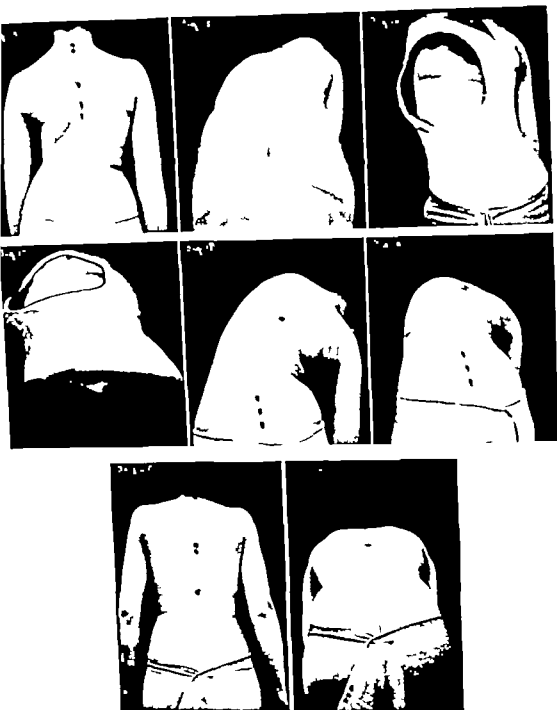


Fig. 14 Standing before.
Fig. 15 Bending before.
Fig. 16 Over-corrected in plaster standing.
Fig. 17 Over-corrected in plaster bending.

Fig. 18 Over-corrected plaster removed, standing.
Fig. 19 Over-corrected plaster removed, bending.
Fig. 20 After three months' exercise, standing.
Fig. 21 After three months' exercise bending.



Fig. 2. Standing before

Fig. 3. Bending before

Fig. 4. Over-corrected in plaster, standing

Fig. 5. Over-corrected in plaster, bending

Fig. 6. Over-corrected, plaster removed, standing

Fig. 7. Over-corrected, plaster removed, bending

and windows are cut (Figs 7, 8, and 9) so that felt may be inserted to push the patient into the position of over-correction.

The placing of these felt pads is shown best by a diagram (Fig. 10). In many cases after the rotation has been removed the lateral curve which is more persistent may be pushed into the over-corrected position by cutting out beneath the shoulder and over the hip and inserting felt pads on the opposite sides (Figs. 11, 12, 13). The length of time necessary to hold the patient in an over-corrected

position in order for the structure to change depends upon the severity of the deformity. In one of moderate degree the following rules, which are best illustrated by the history of a corrected case, have seemed to produce the best results, but they are subject to change and further experience may cause a complete modification of them.

Girl, eighteen years (age), with fixed right dorsal curve, slight compensatory lumbar (Figs. 4, 5). Partial over-correction obtained when first corset was applied, felt pads inserted at intervals

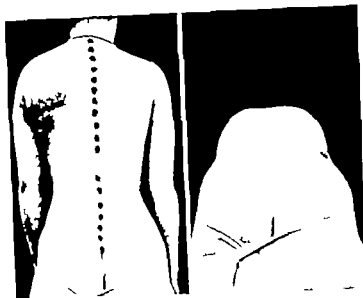


Fig. 28. After three months exercises, standing.
Fig. 29. After three months exercises, bending.
Fig. 30. Celluloid corset, front view.

Fig. 31. Patient in celluloid corset.
Fig. 32. Celluloid corset, back view.

of about one week corset worn five weeks at the end of which the rotation was completely corrected, but some lateral bending remained. New corset applied and worn for four weeks. At this time there was full over-correction (Figs. 6-17) and the patient was allowed to remain in this position for four months. The plaster corset was then removed (Figs. 8-19). Celluloid corset substituted and she was given exercises (Figs. 30 and 32).

The question naturally arises at this point, can all cases of fixed lateral curvature be over-

corrected? There are a large number of cases where the deformity is so extreme that it is futile to attempt to completely reduce it. On the other hand it seems conservative to say that nearly all patients present themselves to the orthopedic surgeon for treatment, and he usually has them under his care long before the distortion has reached a stage where it is impossible to obtain over-correction. In other words, it seems possible

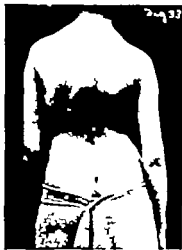


Fig. 33. Standing before



Fig. 34. Bending before.



Fig. 35. Standing, extreme over-correction.

by this method to correct the deformity in all cases before it has become so extreme that only partial relief can be obtained, as most patients are under close observation during a period of years prior to that stage when they become hopeless.

There are many factors to be found in severe cases which make the reduction difficult and must be taken into consideration, yet careful attention to details will frequently make possible an over-correction which at first seems doubtful and the history of a case in which reduction might seem impossible perhaps shows best what may sometimes be accomplished.

Girl, sixteen years of age, definitely first noticed in early childhood has worn plaster corsets for some time without benefit (Figs. 3 and 3). Plaster corset applied with partial reduction of the frame felt applied at intervals corset worn six weeks but some deformity still present. Another corset applied and better position obtained felt inserted to push the spine into the over-corrected position. Corset worn two months and at time of removal over-correction had been accomplished. It was thought best, however to increase the over-correction, so another corset was applied and by inserting felt at intervals for four weeks the spine was turned in the opposite direction the degree almost as extreme as the original deformity (Figs. 4 and 5). Corset allowed to remain for five months, then removed (Figs. 26 and 27) and patient given exercises (Figs. 28 and 29).

In the presentation of this method by other surgeons the criticism has been made that the reduction of the dorsal curve produced an increase in the lumbar or vice versa. In those cases where there is already established a compensatory curve it is necessary to place another strap around the body so that traction may be made to prevent or even remove the compensatory curve and if this rule will be followed it will obviate the difficulty.

The after treatment of the reduction is as difficult as that of club-foot, and must continue over a long period. It is necessary to apply some form of apparatus which will hold the patients in the position of over-correction and they must be removed from it daily for



Fig. 36. Bending, extreme over-correction

exercises. The use of the celluloid corset (Figs. 30, 31 and 32) has seemed to produce the best results, and in the average case it is worn continually for six months and then either day or night for the following six months. During this whole period proper exercises must be given at least once daily. That it is possible to over-correct the deformity very rapidly has been fully demonstrated but there is danger in applying too much force and more time should be taken than was used in the cases which have previously been reported.

The amount of over-correction which can be obtained in a case suitable for reduction seems limited only by the shape of the plaster corset

the amount of felt inserted and the length of time employed to accomplish it.

Girl, age fourteen, deformity fixed but not extreme (Figs. 33, 34). Corset applied and worn for eight months with felt inserted at intervals during the first four months. At the beginning of the fifth month the corset was removed. Patient showed marked over-correction both in the lateral bend of the spine and in rotation (Figs. 35, 36).

That it is possible to remove the deformity in most cases of fixed lateral curvature — excepting the extreme type — seems possible; there are however many of the details of this method which can be improved upon and with this improvement less time will be consumed and better results will be obtained.

THE TREATMENT OF LATERAL CURVATURE OF THE SPINE

A DISCUSSION OF DR. ABBOTT'S PAPER

BY ROYAL WHITMAN, M.D., NEW YORK CITY

I SHALL assume that a formal discussion of a treatment that has attracted such general attention should be rather an account of personal experiences and impressions than a criticism of the subject as presented, particularly as Abbott's views had not changed materially in the interval between the publication of the original article and that which appeared last April. In this latter paper the statement is reiterated and emphasized without qualification that the deformity of lateral curvature of the spine may be more easily and quickly corrected than that of club-foot or bow-leg. This proposition is supported by the histories and photographs of 18 cases, in many of which the deformity was apparently of an advanced type. Yet the average time required for correction was but three weeks and for subsequent fixation but two months. It was further stated that cure, which was apparently accomplished in all the cases, implies restoration to the normal condition.

Soon after the appearance of Abbott's

first paper in June 1911 I had the opportunity to see the treatment demonstrated by him in Portland. It was at once begun tentatively at the Hospital for Ruptured and Crippled and during the past year it has been thoroughly tested under favorable conditions.

The supply of material to illustrate types of deformity and for selection and comparison is practically unlimited. We have been fortunate also in having at hand men of ability and experience to apply the treatment, both in the out and indoor departments. They have attempted to follow Abbott's directions and have had the further advantage of his personal demonstrations and instruction. In this connection it may be mentioned that although the attitude of antero-lateral flexion is novel, the rudiments of the technique at least are fairly familiar, since jackets with openings for pressure and for expansion of the chest applied in the horizontal attitude to permit better primary correction of the spine have been in use for years.

At first the jackets were applied on the

ordinary frame then used by Abbott but during the summer the perfected apparatus, kindly furnished by him has been in use in the hospital wards. The cases selected have been of fixed deformity varying from moderate to severe. Several of the patients were children and a few were adults. All the others were adolescents of the class to which the popular accounts of the treatment would naturally appeal. An average of 40 cases have been under observation during the summer and the effects of the treatment have been carefully checked by casts of the spine and by X-ray pictures. While it would not be claimed that the method has been as effectively applied as it might have been under Dr. Abbott's supervision, still the test has the value of representing the ordinary experience and it is therefore of the character that must eventually determine the range and applicability of any surgical procedure that is to come into general use.

With these qualifications, it may be stated that our observations do not justify the claims of Dr. Abbott. The deformity of fixed rotary lateral curvature is far more difficult to correct than is club-foot, while bow leg offers no standard of just comparison. Many cases in adult life for example are so consolidated by time and by accommodative changes that correction is out of the question.

Many cases in young subjects, particularly the high dorsal curves with sharp backward angulation of the ribs can neither be cured nor greatly improved and certain deformities of the more common type of rachitic origin are in adolescence almost equally resistant. Lateral curvature of the moderate grades can be much improved or eventually cured, the most favorable class being the long dorsal curves with but slight compensation. In certain cases of this type the deformity may be rapidly overcorrected according to photographic and X-ray evidence but it will relapse with far greater rapidity when the support is removed.

It is therefore not only in the range of effectiveness, but in the time required even to correct deformity which is simply the first step toward cure that our experience differs from that of Abbott. This is an im-

portant point for whereas other forms of treatment have the advantage of immediately improving the patient's appearance and carriage this produces a noticeable and even grotesque deformity while the stooping attitude the flattened and compressed chest, are from the hygienic standpoint, undesirable to say the least. Furthermore the treatment is always uncomfortable and often painful.

The patients are excluded by reason of their appearance from ordinary occupations and amusements. They are disinclined to exertion and are often unable to sit or stand for any length of time but kneel or recline or assume other peculiar positions for comfort. Sleep is often disturbed pain in the neck and arms is very common and palpitation and embarrassed respiration are not infrequent. Eventually the patients resign themselves to the inconveniences and discomforts of the treatment but the pain is usually renewed whenever the pressure is increased. If the ribs were equally resistant the problem of progressive correction by this means would be simpler but the antero-lateral part of the chest is very flexible and it may be easily flattened or incurved by pressure. I have seen, for example, the beating of the heart plainly visible beneath the posterior chest wall, displaced by a pressure that had but little effect upon the deformity of the true ribs.

The discomforts or even dangers of the corrective treatment would be of little moment if it were limited to a few weeks, but when it must be prolonged for many months to induce even an improvement time becomes a serious consideration.

If it be assumed that the treatment at the hospital has been conducted with only the average misconceptions and blunders that usually attend the introduction of a new method a literal acceptance of Abbott's statements can but lead to disappointment and discouragement since no treatment can transcend the natural laws that govern the reconstruction of deformed and distorted tissues.

From a more rational standpoint however the conclusion is very different. Cases may now be improved or cured that formerly were

not susceptible to improvement or cure, indicating not only the greater efficiency of the method but that the changes incidental to deformity even of long standing are less resistant than has been believed.

It has been proved already I think, that the underlying principle of the method is correct, namely that as lateral curvature is essentially a flexion deformity rotation should be more easily reduced in flexion than in extension and that deformity should be corrected before functional activity is permitted.

When this principle is generally accepted corrective treatment will be applied at a time

when it may be effective and gymnastic exercises, now a futile routine will find their proper place in the prevention of deformity and as a necessary adjunct in the after treatment.

I think we are indebted to Abbott not only for a more effective means of correcting deformity but for the emphasis that this treatment has laid upon a surgical principle. And even though one must differ from him on the questions of its scope and limitations it will be admitted that his enthusiastic presentation of its merits is in great degree responsible for the renewed interest in this neglected subject.

THE SURGICAL TREATMENT OF PELVIC THROMBOSIS OF SEPTIC ORIGIN

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THE treatment of puerperal pyæmia is of such extreme importance that no apology is required for a contribution to its literature, and any procedure that even offers at first sight a hope of an improved mortality rate is worthy of careful consideration. Even if we take a mean of the mortality rates that have been recorded in the past as following expectant treatment, the percentage is very high and if we regard it as something between sixty and seventy per cent, we shall probably not be wrong. Further we may probably consider the mortality of those cases in which there is suppuration in the veins to be almost one hundred per cent. The introduction of serums and vaccines has on the whole been of little use. In other forms of septic infection they have done undoubted good but in puerperal pyæmia, once thrombosis is established, their effect appears to be small. It is little wonder then that many operators have turned their attention to the possibility of successful interference by surgical treatment. I do not propose here to enter into the history of the surgery of pyæmia of pelvic origin. Those who desire to

study it and it is most necessary that anyone interested should do so can learn it far better from Professor Whitridge Williams' writings than they will from me and to those writings I refer them. I regard my present paper more as an addendum to the monograph on the subject which he published in 1909 and as adding my own personal experience to the facts which he has there collected and published.

We shall not be far wrong if we divide the graver forms of puerperal infection into two classes. In the first class, bacteria pass rapidly in large numbers into the blood vessels or lymphatics, and their virulence is so acute or the resistance of the patient so diminished, that a general spread of bacteria through the body occurs at once and unchecked. In this class there is no place for surgical treatment. In the second class of infection either owing to the lesser virulence of the bacteria or to the greater resistance of the patient there is time for protective efforts to occur and to tend to check the spread of infection from the uterus to the general system. This protection usually takes the form of phlebotomy and throm-

bol. In one or more of the pelvic veins and in the thrombi for a time the invading bacteria are locked up. Sometimes the bacteria disappear and the patient gets well. More usually, however, the thrombi gradually break down and emboli containing bacteria make their way into the general circulation. When this occurs the symptoms of the patient are well marked. They consist of rapid elevation of temperature, marked increase in the pulse rate, and the occurrence of rigors. The passage of the infection into the general circulation is intermittent and for a time the patient is capable of dealing with it so that in a few hours the symptoms lessen, the temperature falls, the pulse becomes less frequent and the patient returns almost to a normal condition. In a little time, however, varying from a few hours to some days, a fresh auto-inoculation occurs, followed by the same symptoms. Such inoculations are repeated at ever shortening intervals. Foci of infection occur in distant organs and finally the patient succumbs. For the first class of infection we in Great Britain have no very satisfactory name. Abroad it is termed acute pyæmia. Here it is known variously as lymphatic sepsis, fulminating sepsis, acute general sepsis, to all of which terms there are objections. The second class of infection we usually term pyæmia, while abroad, where the first class is termed acute pyæmia, the second class is termed chronic pyæmia. It is with this condition I am concerned here, because as the results of other operators show, and as the personal experience that I am able to bring before you to-night also shows, there is a distinct and hopeful place in it for surgical interference.

In 1911 two patients died in the Rotunda Hospital of pyæmia. In one of whom, prior to death, a diagnosis was made of cellulitis in the region of the right utero-sacral ligament. In both of them at the post mortem examination thrombosis was found in the ovarian veins. I accordingly decided that if there was another case presenting similar symptoms, and if there was any reason to think that thrombosis had occurred, I would interfere by operation and try to remove the affected vein or veins. Since then, I have had to deal with

four cases. In three of them an almost positive diagnosis of thrombosis was made before the operation, both from the physical signs and from the symptoms of the patient. In the fourth case no evidence of thrombosis could be found, but the symptoms of the patient so strongly suggested the possibility of thrombosis that I opened the abdomen to explore.

CASE. C. M. aged 20 was admitted to the hospital February 2, 1914. Her previous history does not call for special note. She was in her seventh pregnancy and a practically full-term. Her health during pregnancy was excellent as far as I am concerned, and on admission good. She continued normally the day following admission, vaginal examination having been made by the same nurse the day previous. On the sixth day her temperature rose to 100° F. and her pulse to 94. The uterus was douché and culture taken, a *Staphylococcus aureus* being found. Her temperature fell to 98° F. and remained there for 1 day, subsequently, but on the evening of the eighth day she had a rigor, her temperature rising to 101° F. The leucocytes normal. The next day she had another rigor, her temperature rising slightly higher. The vagina and uterus were again douché, some small shreds of decidua and membranes being removed. The uterus was also plugged with iodoform gauze. The material removed diplococci were seen. The temperature fell to normal and remained so during the following day. On the seventh day five millions of stock streptococcal vaccine were given. On the thirteenth day she had another rigor, and between this and the fifteenth day rigors occurred at short intervals. On the fifteenth day I examined her internally and found an swelling in the right broad ligament. This swelling was not adherent to the pelvic brim and did not suggest cellulitis. It was about the size of an egg. Taking this swelling for venation, the case continued rigors. I decided to open the abdomen, and I did so, few hours later. I first found a hard, brazen swelling in the right broad ligament, that could be traced to the right pediculo-peritoneal ligament and along the course of the ovarian vessels upwards beside the internal vertebra. The tube was congested, but otherwise normal. I tied the uterine end of the broad ligament and incised the peritoneum over its face and then in the little direction as able to enucleate the mass in the broad ligament and to trace it upwards along the course of the ovarian vessels until I got up almost to the insertion of the inferior vena cava. I tied the vein high as possible and then removed the whole mass. The operation was extremely simple, the only trouble that occurred being caused by the division of the ovarian artery, when I divided the vein. It was, however, easily caught and tied. It is noteworthy that I was not able to get completely above the clot

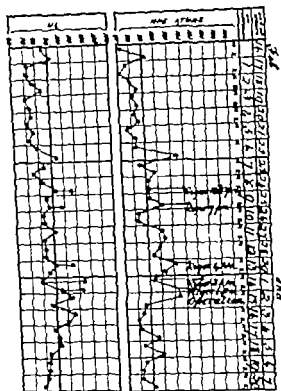


Fig. Temperature chart of Case C M

In the ovarian vein and that my incision passed through it. The first history of the patient was entirely satisfactory. Her temperature fell to normal almost at once and her pulse to normal in 1 day (vide Fig.). There was a slight recurrence of temperature the 10th and 11th days owing to bowels associated with some cellulitis in the remains of the broad ligament. It quickly however fell to normal, and the patient left the hospital still on the forty-first day after the confinement the temperature and pulse having then been normal for more than a week.

I append to this paper Dr Rowlette's report of the specimens which were removed and all I need say here is that the swelling in the broad ligament consisted of the thrombosed branches of the ovarian vein and that the main trunk contained pus in its lower part while its upper part was occupied by a thrombus that had not yet broken down (vide Fig. 2).

CASE M D aged 26 was admitted to the hospital on October 6, 1902. She was in her third pregnancy and 1 full term. She was confined on the following day there being a slight tear of the



Fig. Thrombosed ovarian vein and right broad ligament removed in Case C M. proximal end of ovary, containing thrombus, embolized extremity of Fallopian tube, section of dilated ovarian vein containing breaking down clot.

perineum which required one suture. During the labor 4 genital examinations were made. The patient said that during pregnancy she had had a yellow discharge for which she had on several occasions attended another hospital. The perineal suture was removed on the seventh day up to which time her temperature had never exceeded 100°F or her pulse 90. The perineum had not however healed. On the eighth day the lochia were lightly fresh and the uterus was doughy. At morning her temperature was 101°F in the evening it fell to 100°F and the next day to normal where it remained for three days. During all this time on only one occasion her pulse above 90 and for the most part it was below 85. On the thirteenth day her temperature rose in the evening to 101°F and the next morning to 101.5°F. There is nothing on the chart at this time to show that she had had rigor her pulse still remained slow only on 2 occasions registering above 90. The lochia which had been normal for some days, ceased. On the evening of the sixteenth day the temperature again fell to normal but on the following evening it rose to 101.5°F. On the eighteenth day of the puerperium, she had temperature of 101.5°F with rigor. The next day there were two rigors and one or more on each of the following days. On the twenty-first day in the evening both temperature and pulse fell to subnormal and remained so for some twelve or eighteen hours. In the middle of the next day however she again had a rigor. Rigors continued for the most part at intervals of couple of days until the twenty-ninth day when they became more frequent until the thirty-second day from which day to the thirty-seventh there was a decided drop in both temperature and pulse, and an absence of rigors. On the thirty-seventh day the temperature rose again and rigors occurred on the thirty-eighth and the thirty-ninth days (vide Figs. 3, 4, 5). All this time she was getting streptococcal culture every second day in doses of 5,000,000. During this time I had been laid up and on my return to the hospital on her thirty-ninth day I examined her and felt on one side a tense cordlike structure

lying approximately in the course of the ovarian vessels. I accordingly came to the conclusion that I was dealing with a thrombosed vein, and decided to operate. In this case the condition I found was entirely different from that found in the first case. There was no cellular infiltration of the broad ligament. There was thrombosis of the initial tributaries of the right ovarian vein, but this thrombosis extended very little if at all above the infundibulo-pelvic ligament. The ovarian artery, however, presented extremely thick walls. Its lumen was closed and blood did not pass through it. I extricated the broad ligament and the ovarian vessels as high as I could reach, but here again I had to leave the last inch or so. The immediate result of the operation was beneficial. Rigors ceased for two days, the temperature remaining below 100° F as shown by the twelve-hourly taking. On the second evening after the operation, however, the temperature rose to 101° F and the following day a rigor occurred, followed by another the next day. There was then a period of some intermission for about five or six days until the fifteenth day when another rigor occurred, followed four days later by another. During this period the patient's temperature fluctuated considerably and I feared the operation was not going to be a success. However, on the fifty-sixth day the temperature and pulse both became normal and remained so permanently, the patient leaving the hospital quite convalescent. The report of the strictures removed appears later. It will be noticed that the most marked lesion was in the ovarian artery (vide Fig. 6).

The third case was almost of an identical type to the first, except that it was allowed to go on longer before operation and that in every way it was more severe. It ended fatally.

CASE 3. K. W. aged 23, was confined in the hospital January 2, 1903. On the third evening her temperature was 100.5° F. The next morning her pulse was 60 though her temperature was only 98° F. The lochia, however, was somewhat fetid, and in the evening she was douché. On the next two days both temperature and pulse were normal, so that up to the sixth day on only one occasion had her temperature exceeded 99° F and on only one occasion had her pulse reached 60. On the seventh evening she had a rigor her temperature rose to 104° F and her pulse to 35. The rigor occurred after douché. Such was given because her temperature at the ordinary taking was 101° F and her pulse 20. Her temperature was up again the following evening to 102° F and the next evening to 103° F with a pulse rate of 20. The next day the eleventh, her evening temperature was normal and her pulse to 60 but during the night she had a rigor her temperature reaching 103° F and her pulse 4. From that day on up to the eighteenth, she had history of recurrent rigors, the tempera-

ture varying between 98° F and 105° F and the pulse between 50 and 90 (vide Figs. 7 & 8). On several occasions the uterus was douché, and streptococcal vaccine in doses of 5,000,000 was administered in regular intervals. Cultures taken from the uterus during this time showed that streptococci and bacilli of different sorts were present. I examined her on the eighteenth day and found definite thickening on the right of the uterus. This thickening possessed similar characteristics to that met with in the first case but it could be palpated above the pelvic brim distinctly extending upwards along the course of the ovarian vessels. I came to the conclusion that I was probably dealing with thrombosed veins and decided to operate.

On opening the abdomen, I found a very similar condition to that found in Case 1 except that it had gone very much further. Septic peritonitis was on the point of arising and there was dirty semi-purulent fluid lying in the lower part of the peritoneal cavity. The right broad ligament as brawny and thickened, the tube in congested state, but otherwise normal, running along the top of the ligament. The thickening extended upwards along the infundibulo-pelvic ligament and then along the side of the lumbar vertebrae following the course of the ovarian vessels. I removed the broad ligament in similar manner to that adopted in the first case, and I followed the ovarian vessels upwards as far as I could (vide Fig. 9). Along their course I found two small abscesses with pus indicative of coli infection. The wall of the vein was very friable and when I had removed about four inches of it, it broke across. A further piece was then removed separately. Pus exuded freely from the broken ends of the vein. I closed the peritoneum as far as possible over the bed of the vein. I drained the small abscesses in the flank through incision in the flank, and I drained the pelvis both through Douglas's pouch and through a rubber drainage tube in the lower end of the abdominal wound. The last named as put in because so much of the infection lay above the brim of the pelvis.

The patient stood the operation fairly well, and the following day her temperature never rose above 100° F her pulse maintaining level between 20 and 40. This, however, was not surprising as after the operation her pulse was 60. The following day, however, her temperature 101.8 reached 105° F and she had a rigor her pulse rate reaching 50. The next couple of days she was better but the next—the twenty-third day of the puerperium—she had another rigor. For four days she then ran decidedly better course. There was no marked fluctuation of temperature, which remained approximately about 100° F her pulse rate ranging between 20 and 30, odd times reaching 40. On the whole although her condition indicated the presence of pus somewhere, still it was fairly satisfactory, considering her state at the time of operation. She however developed a superficial edema of the upper part of the right thigh and in the right

Fig. 4. Temperature chart of Case (continued) X signifies fever

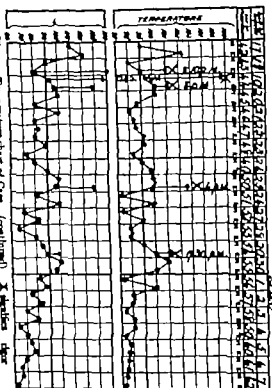


Fig. 5. Temperature chart of Case M. D. signifies fever

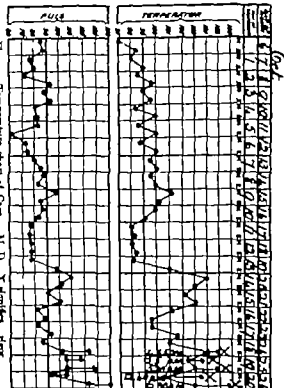


Fig. 6. Temperature chart of Case (continued) X signifies fever

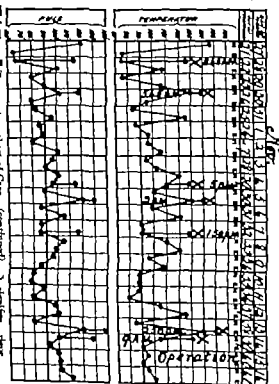


Fig. 6. Thelone 1 and thrombosed uterine artery thrombosed ovarian and remainder of blood supply removed in Case 6. Thrombosis in distal end of ovarian vein, 5, proximal end of the broad and thrombosed artery 4, ovary



labium majus which was as subject the occurrence of a fiber thrombosis.

On the twenty-fifth and thirtieth days she was met with several rigors. On the thirty-first day I again examined her and I found that there was a good deal of thickening in the region of the right uterine vessel and that there was a ridge thick once a finger running along the right wall of the vagina beneath the mucous membrane and suggesting an enlarged and pus-filled suppurating vein. The condition of the patient was very bad but I thought that the only possible harm was further operation and on the same day I opened the abdomen, seen no more I thought it possible I should find thrombosis of the uterine blood vessel. I decided to ligature it. On opening the abdomen, however, I found that only the thickening of the tissues of the posterior wall of the uterus the result of the previous operation. I was able to identify the vessel and that there certainly was no thrombosis — the vessel was in the upper part of the internal iliac. The abscess from which the ovarian vein was removed was in comparatively high position and the general peritoneal cavity was quite healthy. The thickening around the uterine vessel was very obvious, and so I cut down on it there.

Along the right side of the uterus, no came a small collection of pus around the vessels. I cut the latter across and I think put me out of some of the vein. I found the pus burrowing out. I along the course of the vessels and then following them in and out the uterus. I therefore decided to remove the uterus and ovaries. I have drained the uterus after the general mucous membrane which from the uterine transverse process is in the end. On examining the uterus subsequently the mucous membrane was as in a rough condition suggesting septic endometritis. The patient took the operation well considering her state and after the pulse steadily fell until 1.8 at the following day it was only.

and her temperature 95.5. She slept well during almost the entire night. From 8 a. m. however both temperature and pulse began to rise and 1.8 p. m. her temperature was 97.4 and her pulse 90. The next day her condition was much better. It had been prior to operation repeated rigors, temperature ranging between 97 and 98.1 and pulse ranging from 100 to 120. I did not expect her to survive that night but to my surprise the next day she seemed decidedly better. The improvement, however, as only temporary and on the thirty-fifth day she began to show signs of septic infection in the lungs and died on the fortieth second day.

Now in spite of this result I consider that this case in no way contra-indicates operation in such cases, but rather that it shows that operation is distinctly advisable. I have no doubt in my own mind that if the patient had not been operated on the first

time death would have resulted in a comparatively short time. Septic peritonitis was just starting and pus was apparently discharging freely from the ovarian vein into the vena cava. I think that if I had operated at an earlier date when the condition present more resembled that found in my first case the patient's life might have been saved. Even as it was she got over the first operation most satisfactorily; there was no attempt at septic peritonitis and had it not been for subsequent thrombosis extending from the uterus into the other veins, I think that her life would have been saved.

It will be noted that in each of the three foregoing cases there were definite physical signs found before operation. In addition to the presence of intermittent high temperature and recurrent rigors, I will refer again to the nature of the physical signs and their value as a diagnostic element. The fourth case I have left to the last because as I have already mentioned, I operated here in the absence of physical signs though in the presence of definite pyramic symptoms.

C. A. M. N. April 26, 1902. On the 1st of the hospital on September 10, 1901. It was her first pregnancy and she was a full-term labor occurred several days after admission the patient having been examined to the same time. The labor normal as for laceration of the perineum, which was sutured with several sutures of silk and gut. The patient's temperature there remained normal until the fifth day when she had a rigor in which the temperature reached 104.5 F. and the pulse 120. The uterus was doubled and found to be empty. A culture of the lochia and discharges were seen to be present. The perineum was found to be very unhealthy and the stitches were taken out and the wound dressed with iodoform. The next day she had another rigor the temperature reaching 103 F. and the following morning, third day, the temperature reaching to the same height. The following day, however, the temperature rose to 104.5 F. and the pulse 120, but the next morning both were normal. Vaccine injections were begun on the sixth day and continued every second day throughout — streptococcal vaccine in doses of 5,000,000 being given until the eighth day, then atrophy bacococcal vaccine as also given in doses of 5,000,000. On the tenth day the patient again had a rigor followed by second on the twelfth day. On the twelfth day I decided to operate though I could not get any definite physical signs. On opening the abdomen the broad ligament was found to be normal and there was no thrombosis in any of the

Fig. 6. Temperature chart of Case 3 (continued).

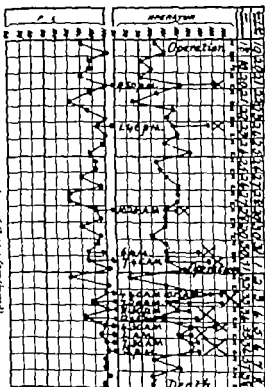


Fig. 7. Temperature chart of Case 3. L. W. X signifies fever.

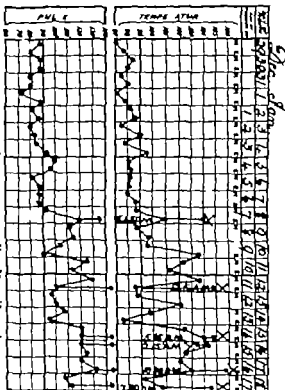


Fig. 8. Temperature chart of Case 3. M. M. C.

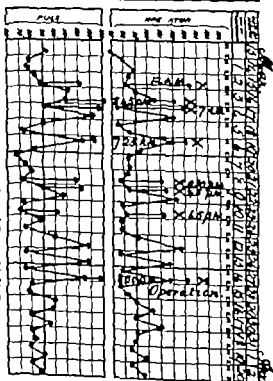


Fig. 9. Thrombosed ovary with right broad ligament removed in Case 3. Following resection of the thrombosed ovary, the broad ligament is sutured by the broad ligament and supporting broad ligament is preserved and the dilated and convoluted part of ovary.



definite and very fairly characteristic physical signs. The two conditions which one is most likely to confuse with thrombosis are I fancy pyosalpinx and cellulitis in the broad ligament—that is to say cellulitis without thrombosis. I think in both these conditions one would expect, not so much recurrent rigors, as a more or less persistent range of high temperature associated with considerable pain. In the thrombotic cases, pain appears to be almost absent except perhaps at the start of the thrombosis, when it is sometimes present along the course of the affected vein. Then in cellulitis the effusion in the broad ligament extends out to the pelvic brim and is firmly attached to the pelvic wall so that the broad ligament is very fixed. In the thrombotic cases that I have seen on the other hand even when there was a considerable amount of cellular infiltration round the thrombosed vein the broad ligament was not fixed. Moreover I think cellulitis is usually tender and certainly a pyosalpinx in its acute stage is highly tender. In thrombosis, on the other hand tenderness is not well marked and when present I usually slight. I should then be inclined to say that a patient with rigors and an intermittent temperature and pulse rate in whom a cord-like swelling can be found in the broad ligament or passing across the walls of the pelvic cavity is possibly suffering from thrombosis of the pelvic veins. Further that if one finds, instead of cordlike swellings, one firm swelling not markedly tender not firmly fixed to the pelvic walls, not fluctuating a diagnosis of thrombosis with considerable peri venous inflammation may safely be made. How far one is justified in performing an exploratory laparotomy in the presence of marked pyretic symptoms when definite thrombosis cannot be felt by bimanual examination, is another question. The case I record ended fatally but I do not think that anyone who looks at the chart will consider that the operation in any way contributed to the patient's death. She rallied well from it, and, but for the later occurrence of thrombosis in the pelvic veins, I think one might have expected a good result. This case however raises the question of hyster-

ectomy in pyrexia and this is another matter with which for the time being I am not concerned.

REPORTS BY DR. ROWLETTE, PATHOLOGIST TO THE HOSPITAL, ON THE SPECIMENS REMOVED BY OPERATORS

CASE C. M. The specimen removed is coical mass of connective tissue, five inches in length, together with the ovary. The latter is large (4 inches in diameter) and soft and shows *oophoritis*. The tip of the coical mass presents a vein $\frac{1}{2}$ inch in diameter filled with firm thrombus. One inch from the end the vein wall has disappeared, and the surrounding tissue is broken down, leaving an oval bony cavity filled with pus. At the other end of the cavity the vein is again found, and is thrombosed. Several smaller veins are found embedded in the connective tissue and filled with thrombi.

Microscopic examination. The connective tissue is densely infiltrated with polymorphonuclear leucocytes. The tissue along the vein walls is more densely infiltrated. The thrombi are also densely infiltrated. The contents of the bony cavity show no sign of thrombus.

In smears of the pus cocci and Gram-negative bacilli are found. Cultures proved the latter to be *B. coli*.

The ovary is oedematous, and the surface shows some infiltration with polymorphonuclear leucocytes.

CASE M. D. The specimen removed consists of the ovary and part of the broad ligament. The ovary is normal in appearance. The *perimetrium* of the broad ligament is partially covered with a bit purulent exudate. The substance of the ligament is felt a firm and four inches in length, as thick as lead pencil. Close to the end was filled with firm thrombus.

Microscopic examination. The ovary is normal. The cord is found to be occluded with thick walls. These walls consist chiefly of fibrous tissue, the outer coat being infiltrated with polymorphonuclear leucocytes. Contained in the tube is an organised thrombus.

The *ovis* is similarly infiltrated, as also the contained thrombus.

The connective tissue of the broad ligament shows a minor degree of infiltration and is congested.

Bacteriological examination was negative.

CASE J. K. W. The first specimen consists of ovary and part of broad ligament. The entire mass is bright red in color and covered with purulent exudate.

The ovary is large, globular (4 inches diameter) soft and oedematous.

The tube is thick and soft and the fimbriae are adherent.

The connective tissue of the broad ligament is firm,

and there is a cylindrical solid mass running from the ovary to the uterus. Embedded in this mass are several veins, which in section, exude pus.

lytic pic *n* *ation* The *ery* is edematous and infiltrated with polymorphonuclear leukocytes. The *l* or *is*, as regard its outer coats, similarly affected, but the mucous membrane is normal. The *rine tissue* of the broad ligament is also inflamed, particularly i the *sols* then surrounding the *rima*. The *walls of the tri* re densely i
filtrated

The pus contained large variety of cocci and bacilli, including streptococcus and various saprophytes.

The second specimen consists of the uterus. It is soft and cedematous, and shows patch of flamed and necrotic endometrium on the posterior wall.

Microscopic studies The muscle of the terine wall is edematous and infiltrated with polymorphonuclear leucocytes.

The endometrium is also inflamed and is atrophied in the patch mentioned.

Str. *Microc* and various saprophytes were obtained by culture therefrom.

APPENDIX

Since writing the foregoing another case of pyæmia has come under my care the features of which are so striking as to warrant very close attention.

CASE 5: M McC aged 7 in her first preg
nancy is confined on March 3, 03. To da

Later she had a rigor and the rigors recurred practically at daily intervals, for seventeen days. Their general character will be seen from the chart (vide Fig. 10). On several occasions I made a careful pelvic examination, but could never find any evidence of thrombosis. She became gradually worse and, on the thirteenth day as she was rapidly going to the bad, I decided that I would operate. It was obvious that there was no thrombosis of pelvic veins so that no question of excision arose. In view of the other case of a similar kind, which I have recorded in the foregoing paper (vide Case 4) I was in favor of a hysterectomy and so I decided to open the abdominal cavity and tie the ovarian vein doing nothing else. My object in this was to cut off the supply of infected emboli that were coming from the placental site. Accordingly I opened the abdomen on the fifteenth day after the confinement and, as I expected, I found no evidence of any intra-pelvic or peritoneal trouble. I therefore ligatured both sets of veins, at the infundibulo-pelvic ligament, and divided them. The veins in the right broad ligament burst presumably showing that they drained the placental site and I had to retie them in a couple of other places, otherwise there was nothing special to record of the operation. The later history of the patient is very clear from the chart. Two evenings after the operation there was a temperature of 100.5 F and on the third evening a temperature of 101 F. I however felt a normal temperature the next day and the remainder of her convalescence as practically afebrile. I may also say that both before and after operation the patient received regular injections of vaccine.

PROSTATECTOMY

B. JOHN B. DEAYER, M. D. Sc. D. LL. D. PHILADELPHIA
Professor of the Practice of Surgery, University of Pennsylvania; Surgeon-in-Chief, German Hospital

ENLARGEMENTS of the prostate gland leading to urinary obstructions are due in the great majority of cases to benign hypertrophy. The condition designated as benign hypertrophy in its application to prostatic disease, is a protean one comprising a number of changes in the constituent parts of the prostate leading to enlargement of the organ which we must understand to appreciate the clinical details. Simple tumors of the prostate occur with great rarity and its enlargements are usually due to increase in the epithelial or inter-

stitial tissues, or both, with the production of fibro-adenomatous, fibromyomatous and intermediate types of growths. When the fibrous and myomatous elements increase at the expense of the glandular portion, the result is the small, dense prostate in which the normal alveoli are diminished in size and number. If on the other hand the hyperplasia affects chiefly the glandular elements of the organ, the result is a soft, fibro-adenomatous easily enucleable type of tumor. More or less chronic inflammation is frequently associated with prostatic hyper

trophy and markedly influences both the symptoms and the ease of enucleation.

Benign hypertrophies, as stated above, may show every degree of gradation from the large soft and sometimes cystic tumor which practically starts from it bed with the relief of the slight tension of the overlying vesical mucosa to the absolutely non-enucleable fibrous type small in size and of extreme density. These various changes may also be found in different areas of the same tumor so that the size and density of a prostatic tumor to rectal examination does not absolutely settle the question of its enucleability for a small tumor may be the miniature of the larger type and shell from its capsule quite as readily. Furthermore the small tumor may be so situated as to seriously obstruct the vesical outlet. These pathologic changes begin in different portions of the gland, but the effects of every enlargement result from encroachment of the tumor on adjacent structures. The primary change in the majority of cases regardless of the point of origin of the growth is an increase in the vertical diameter of the gland, with elevation of the vesical neck and alteration in the size, direction and axis of the prostatic urethra. It follows that a prostate enlarged in its transverse diameters, a change readily determined by examination of the rectal surface usually shows intra-urethral and intra-vesical enlargement as well although the converse is by no means true for a prostate normal in size per rectum may contain a small tumor at the vesical neck completely obstructing urination. The small fibrous prostate offers obstruction to urination as a rule by the actual diminution in the caliber of the prostatic urethra through direct pressure rather than in a relative obstruction from alteration in the position of the vesical orifice or in the axis of the deep urethra, factors which are operative in adenomatous types of enlargement. The enucleability of hypertrophied prostates is largely dependent upon the pathologic change present in any given case and the preoperative determination of this point is usually possible and should influence us in our choice of operation. The encapsulated and therefore enucleable adenomatous masses markedly enlarged in the vertical axis and for this reason more accessible from above are removed with surprising ease by the suprapubic route. On the other hand, the dense fibrous type, which comprises about 15 per cent of benign hypertrophies, lacks not only this comparative accessibility but of greater importance lacks also an encapsulation that permits of its being shelled out. As we have stated, there are intermediate cases in which it is impossible to determine the best method of procedure but as a general rule we are more often gratified to find a doubtful case easy of suprapubic enucleation than chagrined in making the fibrous type for an enucleable one in the employment of the upper route.

Of all the means employed for the determination of the most appropriate operative procedure in enlargements of the prostate the cystoscope is the most valuable one at our disposal. By its use we learn not only those most important considerations, the relation of the enlarged gland to the internal vesical orifice and the degree of intravesical projection but also the condition of the bladder mucosa, the presence or absence of diverticulation, the location of calculi which complicate about 14 per cent of cases of prostatic enlargement and determine their size and shape and whether free or encysted, all of which factors influence to a degree the choice of operative procedure. Cystoscopic examination also furnishes detailed information of median prostatic projections so frequently the cause of marked obstructive symptoms. It is of little practical importance whether these so-called median lobes arise from isolated lobules beneath the floor of the prostatic urethra or from one or the other lateral lobes, but it is of the greatest possible importance for us to know first, if such a condition is present, and secondly if it is the cause of the patient's symptoms, and, as a corollary, the indicated procedure for its removal.

All of these questions can be answered in the interpretation of the cystoscopic picture when based upon wide experience with the use of this instrument in cases of prostatic enlargement. There are a number of instances in which the cystoscopic examination

is unsatisfactory or impossible either on account of excessive hemorrhage inflammation and the associated irritability of the deep urethra and vesical neck, a complicating epididymo-orchitis, or in the presence of such marked distortion of the prostatic urethra that it becomes impracticable to traumatize the patient with forcible introduction of a straight and rigid instrument. Nor do I advocate the use of general anesthesia to permit of a cystoscopic examination when severe pain and irritability of the bladder under local anesthesia make the procedure impossible. As a rule, however we gain more information of the prostatic obstruction and the legacies it has left on the bladder with a cystoscopic examination, and with no greater danger than is derived from the combined use of all other methods of examination. These latter including rectal palpation X-ray examination of the entire urinary tract, measurement of the urethral length, and estimation of the amount of residual urine and of the capacity of the bladder must not be neglected.

An additional cause of urinary obstruction is found in a rigid condition of the perimeatal tissues of the internal vesical orifice. The consequent loss of elasticity and expansibility of the internal vesical sphincter obstructs the urinary outflow and gives symptoms indistinguishable from those due to early hypertrophy of the prostate. This condition frequently an accompaniment of the fibrous prostate, is, I believe most often the aftermath of an antecedent urethritis and prostatitis. Cystoscopic examination in these cases reveals little except the absence of true prostatic enlargement. The patients are improved after the forcible stretching of the tissues incident to the introduction of the instrument, and this gives us the key-note to treatment — dilatation of the deep urethra and internal vesical sphincter under which the slight nocturnal frequency of urination and small amounts of residual urine disappear and the patients in the absence of a complicating infection quickly return to normal bladder health.

Benign hypertrophies of the prostate are indistinguishable from carcinoma in its early

stages. This applies not only to the clinical picture but also to the differential microscopic diagnosis. An area of hyperplasia of the acini with its multiple layers of columnar and cuboidal cells closely simulates carcinoma and the differential microscopic diagnosis between atypical adenomata and cancer is as difficult a one to make as in the analogous conditions affecting the mammary gland. Cancer of the prostate, like mammary cancer may arise either in the unchanged gland or upon the basis of a pre-existent adenoma. In the former instance the condition presents no characteristic clinical symptom in the operable stage. The chief characteristics of the carcinomatous prostate are nodularity increased density and immobility these usually occur with little or no general increase in the dimensions of the organ, but regardless of size, there is a peculiar stony hardness to a carcinomatous nodule that is practically diagnostic, and assuredly so in the presence of fixidity of the gland. A nodular tumor of extreme and often irregular density firmly fixed to adjacent structures, especially to the rectal wall, and with continuous referred pains spreading upwards between the seminal vesicles, undoubtedly bespeaks carcinoma but also assures us of the hopelessness of operative cure. When we speak of the absence of distinguishing signs in early cancer we have in mind the rich lymphatic supply which carries the malignancy beyond the limits of radical excision long before a nodule is appreciable to rectal palpation. In a prostatic cancer arising from a pre-existent adenoma the signs suggestive of malignancy are often wanting, and we may remove a large soft and easily enucleated tumor secure in our clinical judgment of its benignancy only to find malignant changes in the routine study of microscopic sections. Carcinoma is found in approximately 10 per cent of prostatic enlargements so that this factor must play a large part in forming our opinion on the proper treatment of the individual with a hypertrophy of this gland. From 30 to 35 per cent of men beyond the age of sixty years have some degree of prostatic hypertrophy while in only 16 per cent of these individuals does the enlarged gland

give rise to clinical symptoms. It must be determined therefore in the first place whether the urinary symptoms are caused by increase in the size of the prostate and secondly if the heart and kidneys of the patient will stand the strain of a prostatectomy. With these two important questions answered affirmatively to one's satisfaction then in view of the frequency of unrecognizable malignant involvement, I would retreat from my previous stand for judicious palliation and advocate earlier radical treatment. Every benign prostatic hypertrophy, especially if it is the cause of clinical symptoms harbors the potentiality of cancer and our advice should be, in the absence of positive contra-indications, exactly the same as that given in cases of tumors of the breast-excision. I do not mean to say that every enlarged prostate should be immediately removed but when a progression of the clinical symptoms demands our choosing between palliation and operation I firmly believe that our advice should be for an operation of the radical type. Disregarding the inevitable cystitis and its train of complications during catheter life and for the single reason of an imminent danger of malignancy we must not rest content with any palliative measures.

In advanced cases of carcinoma of the prostate with extensive bladder involvement, suprapubic cystostomy has given greater comfort than perineal drainage, but with either method the relief of suffering is slight. The method of choice for excision of prostatic cancer in the event of its early recognition is by the perineal route, and with the same reasons for its employment as apply to the nonnucleable form of benign hypertrophies. The object of such an operation remains as yet merely the relief of obstructive effects, for the radical procedures as advised by Young await more conclusive evidence of satisfactory results than would justify their employment at this time. As stated above it is our opinion that when it becomes a matter of choice between palliation and operation we should decide in favor of prostatectomy. The surgeon is, however, infrequently called upon to decide this question, for prostates as a rule are sent for surgical consultation on account

of complications arising in the course of catheter life. In these cases the necessity of operative relief is generally self apparent, but in no other surgical condition must we exercise greater surgical care in selecting the proper time for intervention and the best method of procedure.

There are no immediate indications for prostatectomy. In a limited number of cases where attempts at catheterization fail or where with complete obstruction instrumentation produces excessive pain or hemorrhage and in a very few instances of bladder infection so severe that catheter drainage would be obviously inadequate we must institute drainage preferably by suprapubic cystostomy. To recapitulate—in all cases of acute or chronic retention impossible to catheterize, in the presence of severe cystitis, and in all cases in which for any reason it is impossible to form a fair estimate of renal function we must limit ourselves to the drainage operation reserving prostatectomy for future consideration. Tapping of the bladder is a rarely useful method of temporizing. The mortality of prostatectomy performed on individuals in good health and with sound hearts and kidneys is practically nil regardless of age. The majority of prostates, however possess neither good general health nor normal cardio-renal systems and it may be stated as an axiom that the success of all prostatic surgery is in direct ratio to the recognition by the individual operator of the maximum capacity of these organs. The cases when first seen by the surgeon show a condition of functional activity of the vital organs approaching nearer to the minimal than to the maximal point of efficiency. The patient has been perhaps for many weeks, harassed with the pain of frequent catheterization, or with frequent urination in the presence of an overdistended bladder and his vitality practically exhausted with the interrupted rest of nocturnal frequency. Toxins reabsorbed from the inflamed bladder and often from a torpid bowel have added an eliminative task to the kidneys already overburdened with metabolic waste products. Every hygienic detail of a prostatic life is self-arranged to minimize his vesical comfort

and these efforts react injuriously on the kidneys. An estimation of the capacity of these organs to bear the weight of anaesthesia and operation at this time must be obviously misleading. Place these patients in bed with constant catheter drainage encourage the ingestion of large amounts of water clear the intestinal tract with mild purgatives, and after a night or two of rest and comfort the picture of impending uremia will have disappeared and the quantity and quality of the urine reveal a surprisingly good degree of reserve kidney function. It follows that the pre-operative treatment is of greater importance than is the operation itself granting adequate skill on the part of the operator. Of the various methods employed to estimate the working capacity of the kidneys, I attach most importance to quantitative and qualitative study of the urine. We need have little apprehension of uremia after prostatectomy in an individual whose kidneys secrete a normal amount of normal urine for forty-eight hours preceding the operation. The subjects for this operation usually have some impairment of their kidneys independent of any obstructive cause in the lower urinary tract and it is my invariable custom in the absence of the complications spoken of above to insert an indwelling catheter and carefully study the urine from day to day until it reaches a level of maximum in quantity and quality.

After trial of the various kidney functional tests that would bring the estimation of the elimination of the urinary solids to the point of mathematical exactitude I am of the opinion that they have no practical advantage over the study of the chemical and physical characteristics of the urine. Of all measures directed to a diminution of the mortality of prostatectomy that which has proven most valuable in our hands is the indwelling catheter followed in the restitution of kidney function. When the patient's condition has been improved to a degree warranting operation the next question that confronts us is the selection of the method best suited for the particular case at hand.

This has been simplified to an extent by the general adoption of radical prostatectomy with discard of the Botzini operation and its

various modifications together with those misdirected operations performed on the related sexual organs. The question therefore resolves itself into a choice between the suprapubic and perineal routes of prostatectomy. Our advocacy of the suprapubic route is tempered with the principles already laid down that successful prostatic surgery depends upon one's ability to recognize the types best suited for and the skill to perform, either operation. To recapitulate where the prostate is without doubt malignant tubercular or the seat of *incurable gonorrhoea* (a rare indication) and in cases of benign scirrhous enlargement, in all of which conditions the gland is nonenucleable on account of nonencapsulation—difficult or impossible of access from above, with the normal capsule and sheath inseparably adherent and bound down to the surrounding levator-ani muscles and pelvic fascia accompanied as these conditions often are by a bladder of small capacity and rigid walls—in these cases let me repeat successful prostatectomy can only be performed by the perineal route. We follow the technique of conservative prostatectomy devised by Young, not with the idea of saving the ejaculatory ducts but because by the fine exposure afforded by this method it is possible to remove the greater portion of the diseased gland under guidance of the eye and therefore with less danger to contiguous structures. With the exceptions cited above the suprapubic route is preferable because

1. The approach to the prostate is simple and practically bloodless.
2. The enucleation of adenomatous growths is accomplished with ease.
3. The working field is large and under perfect control.
4. The prostate is accessible and can be made more so by digital pressure on its rectal surface and without the danger of injury to the bladder liable with the use of the tractors necessary in the perineal operation.
5. The muscular control of the bladder neck is not disturbed since the internal vesical sphincter lies outside the line of cleavage and incontinence is therefore less frequent following this technique.

6 Permanent fistulae are less frequent after the suprapubic operation.

7 Sepsis occurs less than half as often as with the perineal operation.

8 Drainage is more nearly perfect.

9 Stones can be more easily removed.

10. Uræmia is a less frequent sequel.

11 The mortality is, in properly selected cases no greater and the percentage of permanent cures much larger.

12 Immediate post-operative complications, especially hæmorrhage, are less often noted.

13 Sexual potency is maintained as frequently after the suprapubic operation as after the perineal and the question of sterility is rarely of any consequence.

From this array of facts, it would seem that the perineal operation had no foundation as a routine procedure for the relief of benign prostatic hypertrophy. This is exactly my view of the matter.

In the absence of decided contra-indications, ether retains its place as the anæsthetic of choice. The subjects for prostatectomy usually have lesions of the cardiac, arterial, renal or pulmonary systems, so that the substitution of a drug ordinarily more dangerous than ether becomes a matter of considerable concern. Probably the safest, and when properly administered, most satisfactory substitute for ether is nitrous oxide-oxygen anæsthesia. In the presence of cardiac and arterial disease I believe ether to be a safer anæsthetic than nitrous oxide gas. Our choice of anæsthesia in the presence of pulmonary and renal lesions lies between chloroform, intraspinal stovain and nitrous oxide-oxygen. The field of usefulness of chloroform has been decidedly narrowed by the perfection of the nitrous oxide and intraspinal methods. Stovain gives satisfactory analgesia of the pelvis and lower abdomen in small dosage and with less danger than attends its use in upper abdominal and thoracic work. In cases complicated by renal and pulmonary lesions it is the safest method to employ. This drug must not be used when there is any evidence of central disease of the respiratory system, nor in grave cardiac lesions. Its solution must be of lower specific gravity

than that of the spinal fluid lest it rise to the vital centers when the patient is placed in the Trendelenburg or lithotomy postures. Furthermore with the use of stovain the cerebral centers are spared the depressing effects of peripheral traumatic impression and therefore less shock follows in patients of unstable mental constitution than in the use of any other anæsthetic. Thus multiplicity of methods of anæsthesia meets the demands of a variety of clinical conditions rather than denotes a general dissatisfaction with all methods, and we are fortunate in having a number from which the one best suited to any particular case can be chosen. The primary incision is made with the patient in the Trendelenburg position. This position with water distention of the bladder makes the organ accessible and removes the danger of opening into the peritoneal cavity.

The incision in the bladder wall should be placed high enough so that with the bladder empty it will approach as nearly as possible a right angle with the sagittal plane of the body. This affords better drainage and minimizes the danger of permanent fistula—a likely one with an oblique tract when the opening is made near the bladder neck. The incision through the vesical mucosa overlying the tumor is made near the internal vesical orifice and continued in a circular fashion around this opening. In this manner the mucosa is not torn radially during the enucleation process. The prostatic urethra is inseparable in the great majority of cases from the prostatic tumor and this circular incision removes the necessity of tearing it away at the upper portion of its vesical junction and I believe adds to the ease of enucleation. This method likewise eliminates the danger of urethral obstruction by a tab of mucous membrane projecting into the canal from the ragged edge of bladder mucosa that has been torn from the prostatic urethra. Complete obstruction from this cause necessitated reoperation in one of my early cases. This experience led me to employ the circular incision and since the adoption of this method, I have not met with a post-operative obstruction of this character. Prostatic tumors are usually adherent to

the triangular ligament, and along the anterior borders by virtue of the pubo-prostatic ligaments to the pubes, for it will be remembered that the normal stroma and sheath fuse at these points. These adhesions as a rule offer little difficulty to enucleation but in the event of marked density they can be easily separated with blunt-pointed scissors. Counter pressure on the rectal surface of the prostate assists in its enucleation by fixing the organ and in its service as a guide to the enucleating finger.

As regards hemorrhage this is usually insignificant in amount and easily controlled with hot irrigations but in the event of excessive bleeding, the prostatic cavity must be packed with gauze. Before introducing the gauze into the prostatic bed carry a continuous catgut suture through the upper margin of the lateral walls of the cavity the free ends of the suture to be tied tightly after the gauze has been introduced. The free ends of the gauze project through the incision in the abdominal wall.

The drainage tube should be of large caliber at least one half inch in diameter and so placed that the siphonage of the bag-bond is proven perfect before the patient leaves the table and held in this position by a single suture to the margins of the skin incision. This tube must have lateral and terminal openings to lessen the danger of its obstruction by a fold of mucous membrane. Catheters per urethram do not aid materially in the drainage and are liable to cause hemorrhage in their removal. I rarely use them. In exposing the bladder a point of much practical importance is incision of the prevesical fat rather than tearing through this structure. The severed radicles of the pubo-prostatic venous plexus can be ligated immediately and very little oozing follows, as compared with that seen when the fatty tissue is torn. Incision permits of perfect drainage of a single space with a piece of self-edge gauze or rubber dam an obvious impossibility when multiple cavities are present after tearing through this structure. It follows that sepsis from prevesical infection rarely complicates the operation when this technique is employed. As a final step in the operation, the bladder wall

is anchored to the rectus muscle with a suture of catgut and the incision, if rather large is closed in its lower end and the drainage tube and gauze from the bladder and prevesical space brought out through the upper angle. In the absence of shock which sometimes demands active treatment, the important post-operative possibilities are in their order of frequency uremia, pneumonia hemorrhage and sepsis. Immediately on the patient's return to his bed a subcutaneous injection of 500 to 1000 cc. of normal saline solution is given and the routine post-operative procedures instituted. Venous oozing invariably occurs but rarely in sufficient quantity to give concern.

In the event of excessive bleeding after operation simple measures such as irrigation with hot water through the drainage tube may be tried but it is best not to temporize as these patients bear the loss of blood very poorly. If the hemorrhage is not checked by these simple measures, the patient must be anesthetized the wound opened and gauze packed into the prostatic bed until the bleeding is under control. This radical step is rarely necessary in cases properly selected for the suprapubic operation. Sepsis is a rare sequel of suprapubic enucleation and it is well to remember that an irregular temperature is often seen in those cases in which gauze packing has been used. This gives an entirely different picture than a progressive septic condition and the temperature immediately subsides when the gauze is removed. Sepsis from pelvic cellulitis is usually a fatal complication but its relief is to be attempted by appropriate drainage. As a routine measure the bladder is washed out daily with permanganate of potash or other weak antiseptic solution. The patient is given troscopane and encouraged to drink large quantities of water. Uremia and suppression of urine occur at times in spite of careful selection of cases and judicious treatment both before and after operation. Hiccoughing and nausea are the danger signals. Their occurrence demands frequent gastric lavage followed by the introduction of large doses of magnesium sulphate solution until the bowels are freely open. Absolutely nothing is to

be given by mouth. Hyperdermoclysis 1000 cc. of normal salt solution is given every six or eight hours. Continuous proclysis is instituted and caffeine and sparteine hypodermically with nitroglycerine or not, depending upon the tension of the pulse. The condition is sometimes fatal but energetic treatment along these lines will sometimes save an apparently hopeless case.

Gauze is removed in from three to five days and the drainage tube comes away within a week. A smaller tube may be substituted or one of the various cups used to keep the patient's body dry while the fistula is in the process of healing. If gauze has been placed in the prostatic bed to control hemorrhage, after its removal the bladder should be washed out through the urethra by simply engaging the nozzle of an irrigation tube in the meatus. If the latter cannot be done, which is seldom the case, a soft rubber or English catheter is introduced through the urethra and the washing done through this. The patient is gotten out of bed as soon as possible. This can be safely advised when the gauze is out and the danger of secondary bleeding therefore remote. Small quantities of urine are often passed within the first ten days and this function completely restored

with closure of the sinus in a period of from four to six weeks. Instruments should not be passed per urethram unless the restoration of the urinary function is retarded with signs suggestive of an obstructive cause to explain it. Before discharging the patient a sound should be passed to the bladder but in the absence of any difficulty in its introduction this need not be repeated at least for several months. It is evident that the treatment varies in different cases, but with the proper selection of cases for prostatectomy and with the selection of the proper operation for the individual case attention to the simple details as outlined above will suffice to help the patients to a speedy and complete recovery. The mortality of prostatic surgery is dependent upon the choice of anesthesia and its skilled administration proper selection of cases, which presupposes careful pre-operative study and upon the exercise of care in the after treatment. Unfortunate sequelae are eliminated in our determination of the proper method of operation and its skillful performance so that success, however frequent, cannot lighten the burden of our responsibilities, for operative mortality and morbidity in prostatic disease are merely superstructures invariably built on a foundation of poor surgical judgment.

REGENERATION OF BONE FROM PERIOSTEUM

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WITH the development of bone surgery has arisen the question of the importance of the periosteum in bone regeneration and repair. Clinical and experimental observation has failed to show whether the regenerative processes have their origin in the periosteum or in the cells of the bone itself.

Much has been learned from the careful study of the changes which occur in transplantation of bone and periosteum but wide differences of opinion have arisen as to the

relative importance of the bone and the periosteum in initiating the regenerative processes.

It is impossible to review the extensive literature on this subject; only a brief summary of a few of the publications can be given.

Foremost among the earlier investigators along this line is Ollier to whom we must give especial credit for his accurate observations which only recently have received their just recognition. He maintained that all the transplanted bone including the periosteum

remained alive admitting however that there was some absorption of the old bone ascribed to the cells of the marrow. He described the cells of the marrow as having an canal, and osteoblastic layer of the periosteum of special importance in regeneration and gave preference to living bone which was covered with periosteum for transplantation.

Among the later investigators we find a considerable difference of opinion.

Barth from his experiments arrived at conclusions which were directly opposed to those of Ollier. He claimed that all transplanted bone whether with or without periosteum died and that regeneration took place from the surrounding bone.

Frangenheim found that while the greater part of the bone became necrotic a certain number of the bone cells remained alive. He recognized the influence of periosteum in producing bone but ascribed to it a relatively insignificant part in the process.

Macewen found that pieces of bone without periosteum when transplanted into muscle showed definite signs of proliferation.

Murphy believes that there is always complete absorption of periosteum free bone when it is transplanted into tissue in which there is no bony surrounding but he gives no experimental evidence to substantiate this idea.

Bashkirtzev and Petrov present an interesting explanation regarding the regeneration of bone when transplanted into muscle. They believe that the majority of bone corpuscles die and that only those which receive better nutrition and possess especial vitality remain alive. The presence of periosteum or marrow is not considered necessary for regeneration even though large pieces of bone be transplanted. They believe the chief source of regeneration to be a proliferation of the surrounding young connective tissue element of the muscle which penetrates into the vascular spaces and canals of the bone where through a process of metaplasia they gain the properties of osteoblasts and regenerate the new bone. They called attention to the fact that Ollier had also suggested a hypothesis in his earlier work. In his local experiments the periosteum is al-

mitted to be of value not for its property of regeneration of bone but because it aids in directing bone growth and serves as a protecting membrane for the new bone. The periosteum is also said to produce new bone which however is soon absorbed.

Lubenstetter from his work concludes that transplanted bone dies off but the periosteum remains alive.

A discussion of these various theories can not be entered into but Axhausen's conclusions will be given as they seem to sum up the generally accepted ideas. He says that some of the bone dies but that part of it remains alive that the periosteum and marrow remain alive and produce new bone that when bone is transplanted into a bony bed it makes no difference whether the transplanted bone be living or dead or whether it be covered with periosteum but that there is greater probability of successful regeneration if it is alive and covered with periosteum. He also mentions the value of making longitudinal incisions in the periosteum.

From the transplantation experiments in which both periosteum and bone are used one can not draw any definite conclusions in regard to the regenerating power of the periosteum alone. Some of the earlier experimenters report that pieces of periosteum transplanted by themselves have the ability to produce bone others report opposite results.

Amongst the more recent work is that of Trinci who found that in free periosteal transplantation in rabbits and dogs bone was formed from the periosteum. He refers to similar result obtained by Bonhomme.

Macewen says that the periosteum when transplanted does not produce bone except in cases where there was an abnormal stimulus before it was removed or where small pieces of bone were removed with the periosteum. One might infer from his writings that the periosteum of growing animal may have osteogenic properties.

Carrel has utilized periosteum on his special media and has found that when this growing periosteum is transplanted into substitute tissue it leads to bone formation.

Murphy mentions in a recent article that periosteum from a young individual when

transplanted into a fat or muscle tissue bed in the same individual, may produce a lasting bone deposit. No experimental proof is given.

The consensus of opinion of these observers seems to be that the transplantation of pieces of periosteum may result in the formation of new bone, especially if the animal is young.

Other investigators have made use of very fine pieces, or of an emulsion of periosteum for transplantation. Pochhammer scraped off the cambium layer of the periosteum and transplanted it into muscle with negative results but when he transplanted teased pieces of the entire periosteum bone was formed in 15 per cent of the cases. In another series of experiments he first scraped off the cambium layer of the periosteum and then the outer surface of the bone a mixture of the two was transplanted into muscle and small nodules of bone were formed in 10 to 14 days. He refers to the experiments of Berthiers in which were found bone formation following transplantation of pieces of periosteum into muscle.

Attention must be called to the recent work of T. Jokoi who used an emulsion of periosteum, which he injected either subcutaneously or intramuscularly. He found that six out of ten experiments on rabbits showed active bone formation following autoplasmic transplantation and that even after seventy days there was a tendency to proliferation. In homoplastic transplantation there was active growth while in heteroplastic cases negative findings were the rule. If fresh blood was injected with the emulsion there was no increase in bone formation but if fibrin was used active increase of bone development resulted. If he injected the cambium layer of the periosteum alone there was no bone formation and even if there were also small particles of bone these underwent resorption. Reference is made to a previous and similar work by Nakahara and Dilger.

Bergel has also emphasized the importance of fibrin in stimulating the production of callus.

Many authors have used pedicled flaps instead of free transplantation in order to

obtain additional evidence of the power of periosteum to form new bone.

Pochhammer stripped almost the entire periosteum from the humerus of rabbits, allowing it to remain attached to the bone at the lower end of the shaft. He then arranged the periosteum into the form of a tube which he filled with muscle. He found a small amount of new bone only at the lower end of the tube where the periosteum remained attached to the shaft of the humerus. He then filled the periosteal tube with blood clot instead of muscle, and found a considerable increase in the amount of bone formation. These experiments give no absolute proof as regards the regenerative property of periosteum but they show the marked stimulating effect which blood clot exerts on the growth of bone.

Trinci in his experiments excised $\frac{1}{2}$ to 1 cm. of the shaft of the fibula of dogs. He bridged this gap with periosteal flaps which were turned down from the remaining bone stumps. In the microscopical preparations of the early cases he found new formation of bone in the center of the gap where its only possible source was periosteum and in late cases there was evidence of union between this central new formed bone and that which had developed at the ends of the shaft. He also emphasizes the importance of blood clot and bone particles as a stimulating material for bone formation from the lower layers of the periosteum, and states that there is less active growth of bone if these substances are lacking. The details of his experiments are not clear nor are they free from criticism.

Macewen raised a strip of periosteum from the radius of a dog, leaving it attached to the epiphysis in one case and to the shaft in the other. He carried these strips between the fasciculi of the adjacent muscle and reattached the free end to the cut edge of the periosteum on the shaft. In eight days he found no new formation of bone from the raised periosteum.

Murphy cites cases in which he turned out similar flaps and found new formation of bone on the under surface of the periosteum.

Finally, attention must again be called to the work of Macewen, the summary of which

appears in his recent book on The Growth of Bone. The majority of his experiments are planned to show the osteogenic potency of the growing shaft, and comparatively few of them refer directly to the influence of periosteum on the regeneration of bone. Granting that he has shown that "diaphyseal bone may be reproduced by proliferation of osteoblasts derived from pre-existing osseous tissue and that the periosteum is not essential to bone production nevertheless he does not conclusively prove that the periosteum may not also reproduce bone. He has minimized the importance of the periosteum in too great a degree when he says it acts merely as a limiting and protecting membrane and has no osteogenic function.

A further discussion of the views of the various authors would not help in the solution of this problem. One is forcibly impressed with the variable results of the different observers, working under conditions which appear to be similar. It is possible that further repeated and more exact study will unify the findings.

In order to emphasize the complex system of bone formation and development, a few important anatomical and embryological facts must be mentioned.

Like other connective tissues, bone is formed from a blastemal syncytium, the ground substance of which is composed of white fibrous tissue. Development may take place in two ways from this primary ground substance in one case it is directly transformed into bone in the other it passes first through a cartilaginous stage. The two methods are designated intra-membranous and intra-cartilaginous respectively. In both methods the osteoblasts play an important part arising in one case by direct transformation from the ground cells in the other from the perichondrium. In studying the development of intra cartilaginous bone formation, one can not neglect the important rôle of the perichondrium and periosteum. The embryological development of the marrow cavities of the long bones, and of the Volk-

man's canals are all dependent upon this surrounding membrane and it does not seem probable that so important a structure in embryological development should become inert when there is later call for bone formation.

Even in the normal development of bone we find a considerable dispute as to the exact origin of its various elements. It is not surprising therefore that controversy should arise as to the method of regeneration of bone.

Before proceeding with the description of these experiments a brief definition of the periosteum, both as it is usually described and as it is considered in the following experiments must be mentioned.

Periosteum is made up of three layers

1 Outer fibrous layer possessing blood vessels.

2 Inner fibrous elastic layer made up of a network of elastic fibers and containing lymph spaces.

3 Osteogenetic layer which is more marked in the young bone consisting of delicate bundles of fibrous tissue and a large number of embryonal connective tissue cells namely osteoblasts. After growth has ceased the osteoblastic layer becomes reduced to an inconspicuous stratum included with the inner fibrous layer. The osteogenetic layer is rich in blood vessels which are continuous with the marrow during development. Nerves are also present.

Macewen emphasizes the importance of the loose areolar tissue beneath the periosteum.

In the following experiments the periosteum is considered as that membrane which remains after a careful subperiosteal resection of the underlying bone especial care being exercised that no bone elements be left behind. This is what is usually understood by the surgeon as periosteum.

These experiments were undertaken in order to furnish evidence either for or against the osteogenetic regenerative power of the periosteum. The deductions in the main are based upon the macroscopical findings. In cases where doubt existed as to the nature of the tissue, microscopic examination was made.

The rib was selected for the sake of convenience as it was not necessary to use

Knowing what special care be givened to the blood of operation. In view of the influence of blood clot on stimulating bone growth, it would be interesting to see what effect its presence would have on the experimental results.

splints, and because several experiments could be carried on at the same time on the same animal. Criticism might be made because of the constant motion of the chest wall but this was not excessive even where two ribs were removed, because an intervening normal rib was allowed to remain intact.

The series consisted of forty rabbits, two dogs, and two cats on which sixty-two observations were made. The exact age of the animals could not be determined although the majority of them were young growing animals. The experiments varied in duration from 4 to 249 days and extended over a period of two years.

Method Under ether anesthesia the skin was shaved and painted with tincture of iodine. Incision was made through the skin over the selected ribs to the subcutaneous tissues. In case blood clot was to be used in the experiment, the blood was collected into a sterile tube from the superficial vessels. Incision was next made through the muscles to expose the ribs, the latter being treated according to the demands of the experiment. The severed muscles were restored and the skin closed with silk sutures. The animal was allowed its freedom on recovery from the anesthetic.

The only difficulty experienced was the prevention of a pneumothorax especially in the rabbits where the periosteum and costal pleura form practically a single thin membrane. Pneumothorax in rabbits often proves rapidly fatal.

The periosteum strips easily from the ribs, excepting in the region of the angle at which place the muscle fibers are attached directly to the bone, and at the chondrocostal junction, where the periosteum and perichondrium are found somewhat adherent to the cortex of the bone.

The experiments are arranged into groups according to the method of procedure. In cases where two ribs were operated upon at the same time they will be described separately according to the respective method to which they belong. By reference to the accompanying diagrams it will be seen that there are 9 groups of experiments in which the following methods are presented:

- 1 Simple subperiosteal resection.
 - 2 Simple subperiosteal resection in which a small island of bone is allowed to remain in the periosteal gutter.
 - 3 Simple subperiosteal resection of rib, remaining ends of which are covered with lead caps.
 - 4 Elevation of rib from periosteal bed from which it is separated by interposed muscle.
 - 5 Same as (4) with addition of blood clot in the periosteal gutter.
 - 6 Extensive subperiosteal resection of rib including costal cartilage with addition of blood clot to center of periosteal gutter.
 - 7 Same as (6) excepting that the sternal side is blocked off with paraffin.
 - 8 Same as (6) excepting that both sternal and vertebral sides are blocked off with paraffin.
 - 9 Subperiosteal resection with paraffin at both ends, the interval between remaining empty.
 - 10 Elevation of and removal of a section of the rib the free ends being placed inside of a rubber tube.
- Method 1** Simple subperiosteal resection.

These experiments were performed in order to illustrate the method of regeneration following an ordinary resection.

Result R 5 A Gr XVII, after 5 day showed regeneration: 1 both vertebral and costal cartilage stumps but not complete filling of the periosteal gutter.

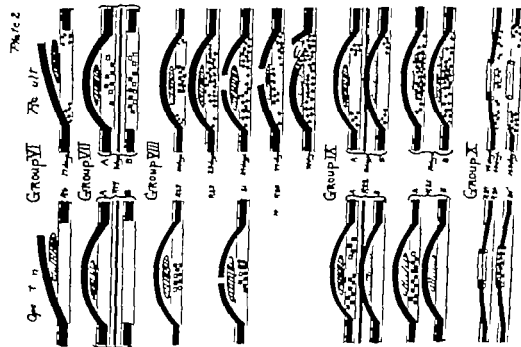
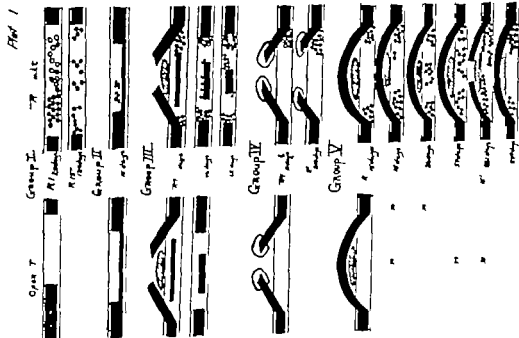
R G I after 20 days showed the entire periosteal gutter filled with cartilage with small island of bone 1 cm. place.

R 50 A G VI after 45 days, and R 5 Gr I after 24 days showed complete regeneration of the rib.

C 3 B Gr XVIII, showed almost complete regeneration after 4 days.

Deductions The variability in the findings in R 5 A and R 1 suggest that the regeneration of bone may take place in two ways (1) development of cartilage preceding formation of bone (2) direct formation of bone. It is definite that these experiments do not show whether the new bone arises from the

In the description of the experiments, the method experiments are labeled, the cat experiments and the dog experiments and it designates which rib is described and Gr the group to which belongs.



growth of the bone from the sternal side definite evidence could be obtained as to the regenerative power of the periosteum. In order to accomplish this separation hot paraffin was placed between the blood-clot and the costal cartilage.

Results. In R 33 Gr. XII the new-formed bone was directly continuous with the vertebral stump of the rib. It became evident that the paraffin must be placed at both ends of the periosteal gutter.

Method 8. Extensive subperiosteal resection of rib including part of costal cartilage with the addition of blood-clot to the center of the periosteal space and of paraffin at both sternal and vertebral sides.

Results. I R 38 35 30 4, and D of Gr XIII D B C B and C B of G XVI, and C 3 A, G XVIII isolated islands of bone were found in the periosteal gutter. These were entirely free from any bony connections with either of the severed ends of the ribs. I R 54 A Gr XIX, R 43, Gr XIII R 50 C G XV, R 45 A and R 48 B of G XVI also newly formed bone was found in the center of the gutter but in these cases the central bone was connected by narrow bridges of bone with the stumps of one of both sides.

Deductions. In this group there are nine cases four in rabbits, three in cats, and two

EXPLANATION OF PLATES

Column I indicates the method of operation
Column II indicates the result

}	indicates that two ribs were operated upon at the same time
	indicates normal bone
	indicates regenerated bone
	indicates normal cartilage
	indicates regenerated cartilage
	indicates periosteum
	indicates blood-clot
	indicates paraffin
	indicates muscle

in dogs, where there are definite islands of new bone which are entirely free from any connection with the stumps of the ribs and six cases in rabbits where the greater part of the new bone occupies a corresponding position, but is not definitely separated from the bone at the ends. From the first nine cases there is conclusive evidence that periosteum in the presence of blood-clot has the power of regenerating bone. In the last six cases because of the bridges at the ends, there is a possibility that the new bone has arisen from the stumps of the rib. But in view of the fact that the central portion of the bone was denser and appeared older than the bone of the connecting bridges and since in a greater number of cases the islands of bone were entirely free it would seem probable that the new bone originated in the center of the periosteal gutter and that the bridges of bone to the stump of the ribs were of secondary development. And this seems all the more probable because in every case excepting one where connection with pre-existing bone had been established the duration of the experiment was greater than where free islands of bone were found.

Method 9. Subperiosteal resection of a rib with paraffin at both ends the interval between remaining empty.

These experiments were used as controls.

Results. In D A C A D r B and R 46 B of G XVI, and R 4 G XVI there was no growth in the center of the periosteal gap, the only new bone being in the region of the bone stumps. In R 50 B G XV R 48 A G XVI new bone was present, but was in direct connection with pre-existing bone. I R 4 C XIV and C Gr XVI islands of bone were formed just as in cases where blood-clot was used.

Deductions. Here we have five definite cases which in the absence of blood-clot, showed no evidence of regeneration of bone. There were however two cases in which newly formed bone was found in the gap but was connected with one or both stumps and two in which there were isolated islands of bone exactly similar to those which were found when blood-clot had been placed in the periosteal gutter. The explanation of these last four cases is not clear. It is possible that the long duration of the experiments in the

two former may have given time for extension of growth from the stumps, but in the other two one can only explain the results by assuming that post-operative hemorrhage had occurred.

These experiments show that in five of the nine experiments where blood-clot was not placed in the periosteal gutter there was no proliferation of new bone whereas of the ten cases described under Method 8 where blood-clot was added nine showed definite new formation of bone. It would therefore appear that the presence of blood-clot must supply some stimulus to the periosteum which leads to active bone regeneration.

Method 10 Elevation and removal of a section of the rib the free ends being placed inside of a rubber tube.

These experiments were performed to determine whether bone which has been freed from periosteum retains its power of regeneration.

Results I R 4 R 26 and D of Cr N. After 46 and 65 days respectively no evidence of new bone as found in the tube on the contrary there was definite evidence of necrosis of the enclosed bone.

Deduction Although these experiments are not exactly analogous to MacCawen's glass tube experiment one would not expect such discordant results if all his assumptions as to the osteogenetic power of bone itself are correct. It must be admitted that by placing the ends of the bone within the tubing possible sources of nourishment may be destroyed.

COMPARATIVE RESULTS

In a number of experiments the several methods just described have been performed at the same time under the same conditions and on the same animals. The experiments have been arranged in the diagrams to bring out these details.

GENERAL DEDUCTIONS AND REMARKS

The most striking feature of the foregoing experiments is the influence of blood-clot in stimulating the formation of new bone. There can be little doubt that the blood-clot exerts some specific influence since the presence of various other foreign substances has

failed to stimulate bone regeneration. Pochhammer found that the addition of agar-agar, gelatine and living muscle tissue did not cause any increase in bone regeneration and in the above experiments the addition of paraffin caused no increase in bone formation. The importance of blood-clot in the regeneration of bone was recognized by Shede who advised the addition of blood-clot after resections for osteomyelitis and by Bier who has recently emphasized the advisability of allowing clots to form in places where new bone formation is desired.

Another interesting feature of these experiments was the absence of the regeneration of bone from pre-existing bone which had been separated from its periosteum.

In cases where the rib was isolated from its periosteal bed there was never any evidence of proliferation from the denuded bone. In fact, in the majority of cases the raised ribs became atrophic. In cases where the severed ends of the denuded ribs were inserted between muscle fasciculi there was never any evidence of regeneration and where fractures were produced in the periosteum free bone no evidence of union was found. These results are of considerable interest in view of the findings of MacCawen and further experiments are necessary to show whether the ribs differ from the long bones of the extremities in this respect.

The constant occurrence of new bone at the angle of separation between the elevated rib and the periosteum raises the question of the relative importance of periosteum and bone in the regenerative process. If one assumes that the newly formed bone arises from the pre-existing bone one would expect that the new bone should extend along the raised rib as well as in the periosteal gutter. The experiments do not show this to be the case. Although the new bone was always formed at the angle between the rib and the periosteum it extended only along the periosteal gutter. It can not be denied that the bone may have had some influence in initiating the regenerative processes but it is significant that the regeneration occurred only where periosteum was also present and we can not but conclude that the periosteum must have acted in some

other way than by merely passively directing the distribution of new bone. It may be that the periosteum possesses some power possibly of a chemotactic nature, which determines the direction in which the new bone shall grow but from these experiments there seems little doubt that it also plays some important part in the actual regenerative process.

In several experiments where the chondrocostal junction was removed it was noted that new bone was formed near the site of the junction. In practically all cases there was also regeneration of cartilage, and in some cases the new cartilage and the new bone were continuous. In the cases where the new bone was separated from the cartilage it is difficult to explain its presence unless it arose from the periosteum. It is possible that the dependent position of this region when the animal is moving around may have caused the accumulation of blood-clot in this area and that the combined action of the periosteum and blood-clot was responsible for the formation of the new bone.

CONCLUSIONS

1 That periosteum especially in the presence of blood-clot, has the power to regenerate bone.

2 That regeneration of bone is not solely dependent upon the presence of pre-existing bone.

3 That regeneration of bone was never found excepting when periosteum was present (I wish to express my indebtedness to Professor Ophüls for the privilege of performing these experiments under his direction.)

Since this article was submitted the following contributions have appeared:
Schepelmann E. Freie Periostverpflanzung. Experimentelle Untersuchungen. Arch f klin Chir 1913 cl. 409.

He finds that the periosteum when transplanted into the omentum mesentery spleen liver etc regenerated persistent new bone and emphasizes the importance of vascularity integrity of the cell and use of entire periosteum.

Albee F. An Experimental Study of Bone Growth, et J Am M Ass. 1913 lx 4 1944

He finds that the periosteum when transplanted into muscle did not regenerate new bone. He thinks that the outer layer of the cortex is necessary and agrees with Macewen in most respects.

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A STUDY OF THE MECHANISM OF THE STOMACH AFTER GASTRO-ENTEROSTOMY BY MEANS OF THE X-RAY

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THE indications for the operation of gastro-enterostomy have become within recent years quite strictly defined. It has been repeatedly proved that in properly selected cases it results, in a majority of instances, in a symptomatic cure and in many other cases it affords great relief and in cases of malignant stricture of the pylorus it affords a palliative relief that is very grateful.

A number of studies of the physiology and mechanism of digestion after gastro-enterostomy have been made. Cannon and Blake (1) did gastro-enterostomy and pyloroplasty on normal cats and studied the movements of bismuth meals with the X-ray at various intervals after recovery. They consider the results under four heads—drainage, vicious circles, kinks and the intermixture of food and duodenal juices.

Drainage. They performed gastro-enterostomy on ten cats. They varied the size of the gastro-enterostomy opening and performed both posterior and anterior gastro-enterostomy. They point out that on account of the position of the cat's trunk anterior gastro-enterostomy is often more of a drainage operation than posterior gastro-enterostomy. After recovery the animals were fed bismuth meals of various consistencies from water to canned salmon and the emptying of the stomach studied with the X-ray by means of the fluoroscope.

They recorded that in most instances the meal left the stomach by the pyloric route. Sometimes it left by both routes and the larger the stoma the more apt the meal was to leave by that route but their general conclusion were that in the presence of a patent pylorus the food left through the

pylorus rather than through the gastro-enterostomy stoma, no matter where placed or how large. They tied off the pylorus in two instances realizing that clinically gastro-enterostomy was usually performed in the presence of a stenotic pylorus but even so the bismuth meal left by the pyloric route. These results they explained by pointing out that the stomach can not empty itself entirely by gravity drainage even under the most favorable placing of the stoma because intra-abdominal pressure is such as to make gravity drainage impossible from the stomach. The stomach is not a passive reservoir but a muscular organ and after the ingestion of the food as the intragastric pressure continues the pylorus becomes the lowest point of the stomach and the intragastric pressure is greatest within the pyloric antrum.

They believe that *vicious circles* are caused by valves that are formed at the stoma by the pressure of food in the stomach and that these valves open only one way.

They oppose gastro-enterostomy too on the grounds of the production of duodenal kinks and the premature intermixture of intestinal juices and food. They recommend pyloroplasty and in their studies of it found that the food left the stomach earlier than in gastro-enterostomy and always continued in a forward manner.

This work has made a deep impression on all who have studied the question. Leggett and Maury (2) performed a gastro-enterostomy on a dog and after recovery they fed the dog a little bag of shot tied to a string so that after ingestion the course the shot took could be followed by means of the string. The bag of shot went out the

pylorus and back through the gastro-enterostomy opening and again out through the pylorus and again back through the gastro-enterostomy opening.

Paterson (3) in reviewing the physiologic effects of gastro-enterostomy concluded that the procedure is not a drainage operation and in order to justify the results pointed out that after gastro-enterostomy the stomach is filled with bile and pancreatic juices (alkaline liquid) and concluded that it is the change in the reaction of the stomach contents that heal the ulcers.

Berg (4) re-emphasized the difficulties that are in the way of regarding gastro-enterostomy as a drainage operation. He expressed the fear that in the spasm of the pylorus caused by ulcer although gastro-enterostomy may relieve the spasm the stoma may later heal up and the ulcer and pyloric spasm may recur. He, therefore recommends occluding the pylorus in all cases of ulcer with gastro-enterostomy.

In spite of these adverse judgments it must be admitted by all who have actually had experience that in proper cases simple gastro-enterostomy is a procedure of great benefit. Sherren (5) for instance in a very carefully studied series of cases in which the patients were nearly all personally interviewed several years after the operation reports that in seventy-two cases more or less relief was obtained in 96 per cent and complete cure is claimed in over 80 per cent of cases.

Our attention having been directed to this contradictory state of the evidence we have subjected certain reliable patients of the thirty-two gastro-enterostomies made by one of us in the last three years to examination with the X-ray. The patients were from Dr. Outland's services at the Swedish Hospital and Bethany Hospital. On all of them he performed posterior gastro-enterostomy.

They were given twelve ounces of fermented milk mixed with 2 drachms of bismuth oxychloride which makes a thick paste and examined with the Minknecht hanging diaphragm in the erect position. Plates were made only for record.

A résumé of the history and subjective condition of the patient at the time of examination with the X-ray reports is as follows in the six cases available for study:

CASE 1. M. Male, æt. 46, was first operated for kidney colic and stone the size of pigeon egg removed from left kidney March 9, 00. On February 8, 01 he re-entered the Swedish Hospital for pain in the epigastrium two hours after meals, belching, vomiting, and acid stomach. There was tenderness found in the epigastrium and over the eleventh intercostal space behind, on the right.

On February 19, 1902 the abdomen was opened and ulcer of the duodenum with cicatrix, just outside the common bile duct, found. Posterior gastro-enterostomy was done.

Examination April 5, 013. The patient states that he feels better than he has for fifteen years. His dyspepsia has not bothered him for a year, except occasionally he has had some pain in the epigastrium which has no relation to meals. He has gained 10 lbs. pounds in weight.

Examination with the fluoroscope after the ingestion of ten ounces of fermented milk and bismuth oxychloride. The lower border of the stomach is seen to be at the level of the umbilicus and the gastro-enterostomy stoma is at exactly the lowest portion of the stomach shadow. The food begins to leave the stomach immediately through the gastro-enterostomy stoma. Food has left the stomach by the pylorus after an interval of thirty-five minutes. Peristalsis is observed along both the lesser and greater curvature. There are waves of peristalsis in the space between the stoma and the pylorus. The stomach is empty in about one and one-half hours. (Fig. and Plates 1 and 2.)

CASE 2. B. Male, æt. 61, entered the Swedish Hospital March 9, 1902. He had been ill for thirty-two years he had three or four attacks of indigestion. They had been gradually getting worse. The attacks began with pain in the pit of the stomach which was almost continuous and which lasted about two weeks, gradually getting worse. Usually at the end of that time vomiting began which relieved the pain somewhat but the vomiting continued for three or four weeks intermittently. He had never been jaundiced. He had lost no weight the last year.

Operation March 9, 02. A hard, cicatrized ulcer of the pylorus was found. No gall-stones were present. Posterior gastro-enterostomy was made.

Examination March 19, 03. The patient had made good operative recovery is feeling and eating well.

The X-ray examination shows a two-pole stomach as the beam is first entered then it sinks into the broad lower pole about finger breadth below the umbilicus. The beam then begins to leave by the stoma in three minutes it trickles out slowly stops

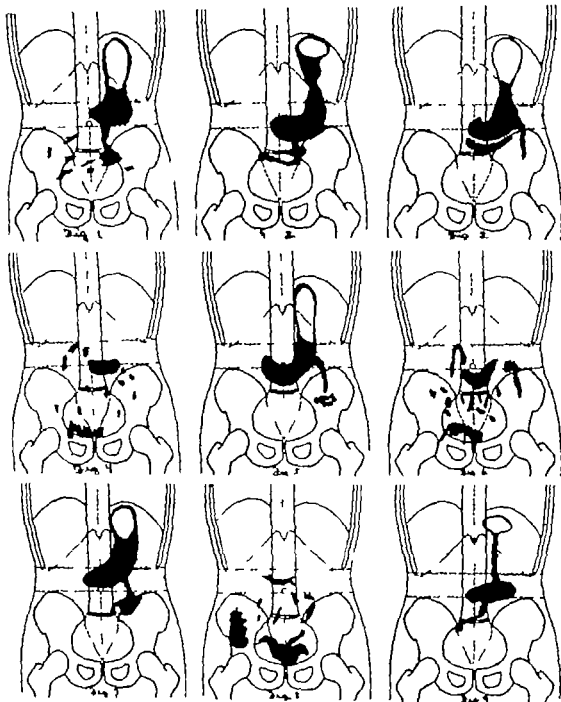


Fig. Case immediately after ingestion of the
beach meal

Fig. Case about three minutes after ingestion

Fig. Case thirty minutes after ingestion

Fig. Case three hours after ingestion

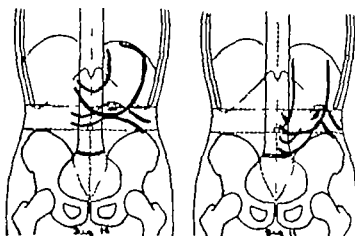
Fig. Case thirty minutes after ingestion

Fig. Case three hours after ingestion

Fig. Case ten minutes after ingestion

Fig. Case two and one half hours after ingestion

Fig. Case ten minutes after ingestion



Figs. 10 and 11. Diagrams to illustrate the placing of the gastro-enterostomy stoma. Fig. 10 is the stoma in the horizontal position and Fig. 11 is the stoma in the erect position.

for a moment to the duodeno-jejunal junction and then passes to the right. The stoma is exactly at the lower pole of the stomach. No food has left by the pylorus at the end of twenty minutes. The stomach empties itself in less than two hours. (Fig. 10 and Plate 3.)

CASE 3. S. Female, aet. 41 entered the St. John's Hospital April 3, 1910. She had had an open dectomy done some time before for chronic dyspepsia, without much relief. At the time of her entrance she complained of pain in the epigastrium before meals. This condition dated back six years. She had had several attacks of haemetemesis. The stomach contents also elicited reaction of blood with the benedictine test. She had kept her weight pretty well. On physical examination nothing of pathological interest was noted save a tense right rectus muscle and great tenderness in the epigastrium to the right.

Operation April 4, 1910. An old ulcer on the duodenal side of the pylorus was found. The pylorus was patent. Posterior gastro-enterostomy was made.

Examination April 5, 1910. Patient states that she has been feeling very well for the last six months. The old pain does not annoy her now. The bismuth meal reveals the stomach in 60 seconds breadth below the umbilicus. No food leaves either pylorus or the stoma for eight minutes, then the food, forced by gastric peristalsis, begins to leave by the stoma, which is not to the lower point of the stomach but about midway up the bismuth shadow in the erect position to the left. By pressure of the hand on the abdomen some bismuth can be forced out of the pylorus. At the interval of one hour the stomach is seen to contain some bismuth. Food is leaving both by the stoma and the pylorus. Bismuth can be seen in the portion of duodenum between the stoma and

the pylorus. At the end of three hours the stomach is empty save for very small residue. There is considerable bismuth in the duodenum. (Figs. 3 and 4 and Plate 4.)

CASE 4. M. Female aet. 34. She entered the hospital May 4, 1910, she had suffered for many years with a very painful acid dyspepsia. The pain came on after meals and lasted for an hour or more. In the few months before her entrance she had vomited once or more times a day and was consequently very weak and had lost about fifteen pounds in weight.

At operation May 9, 1910. Ulcer cicatrix was found just to the pylorus causing stenosis. Posterior gastro-enterostomy was made.

Examination April 10, 1910. The patient states she is by no means well yet. The vomiting has stopped and she has regained her normal weight but still has pain after meals and distress in the epigastrium.

The bismuth meal shows very long, hook-shaped stomach with the lesser curvature below the umbilicus. No food leaves the stomach at all for fifteen minutes then accompanied by vigorous peristalsis small projection shows midway up the bismuth column and to the left. Food then slowly leaves by the stoma and several minutes later some food leaves by the pylorus. Peristalsis is vigorous.

At the end of three and one half hours there is still some food in the stomach. Bismuth shadows are everywhere scattered through the small intestine. (Figs. 5 and 6 and Plate 5.)

CASE 5. R. Male, aet. 63. He was operated November 9, 1910. He had suffered for twenty years with pain in the epigastrium attacks of vomiting, and constipation. At operation an ulcer with cicatrix was found at the pylorus. Posterior gastro-enterostomy was made.



Plate 1. Case 1. immediately after ingestion of the bismuth meal.

Examination March 1, 1913. H. states that he has none of his old pain now and feels very well. H. vomits sometimes if he overeats. The bowels are now too loose; he goes to stool about three times a day. He thinks that food leaves his stomach sooner than it used. He exercises no great concern with his diet and eats about anything that he wishes.

The X-ray shows a broad loop of the stomach, the pyloric antrum being nearly hand's breadth to the right of the umbilicus. The meal begins to leave practically immediately. The stoma is well placed at the lowest point of the dependent portion of the stomach. The edge of the greater curvature is above the pylorus. The bismuth meal leaves the stomach very rapidly through the stoma and appears to collect in sort of reservoir below the umbilicus, apparently in the jejunum, before passing on into the small intestine. Peristaltic waves can be seen between the stoma and the pylorus on the greater curvature; no food leaves by the pylorus.

At the end of ten and one half hours the stomach is empty save for small saucer-shaped residue which is probably in the portion of the stomach between the stoma and the pylorus. The head of the bismuth column is in the ascending colon. Bismuth can be seen all through the small intestine. (Figs 7 and 8 and Plate 6.)



Plate 2. Case 2. half an hour after ingestion of the meal.

CASE 6. K. Male, et 49 entered the S. Edish Hospital March 8, 1913. H. complained of pain, before meals, located in the epigastrium and relieved by meals. H. is bothered with acid eructations. H. has never been jaundiced, does not often vomit, and has lost no weight. Operation on March 20, 1913. An old scar was found in the duodenum. The pylorus was patent. Posterior gastro-enterostomy was made.

Examination with the fluoroscope April 6, 1913. The lower pole of the stomach is to the left and below the umbilicus. The food begins to leave somewhat slowly by the stoma which is well placed to drain the stomach. After entering the small intestine some of the bismuth goes downward and to the left toward the jejunum and some filters over to the right between the stoma and the pylorus along the duodenum; it does not, however, reach the pylorus. After an interval of half an hour some bismuth begins to leave by the pylorus. The stomach is empty at the end of an hour and some of the bismuth is in the caecum. (Fig. 9.)

It will be seen in all these cases that the gastro-enterostomy stoma does drain the stomach. In four of them the food leaves exclusively by the gastro-enterostomy stoma, and in two by the stoma and pylorus. That



Plate 3. Case 2, ten minutes after ingestion of the barium meal.

the food not only leaves the stomach by the stoma route but that it leaves the stomach rapidly and in several instances so rapidly that the conclusion is inevitable that the mechanism is a simple gravity drainage. As Aubourg says, with gallic felicity, the stomach appears to be merely a continuation of the esophagus. That this condition of affairs is permanent is attested by Aubourg's case in which the stoma was seen to be the outlet of the stomach ten years after gastro-enterostomy had been done.

This drainage does not occur so rapidly in all cases and the pylorus is not always put out of commission. In all of our cases, however, the emptying rate of the stomach is much faster than the emptying rate of the normal stomach and in none of our cases did the meal leave by the pylorus alone. That this means of exit is not entirely dependent upon the closure of the pylorus can be attested by two cases (3 and 6) in which at operation no high grade of stenosis was present. Spasm may have been present of course

But those authors who contend that the gastro-enterostomy stoma has no function, except with an absolutely occluded pylorus, have a very difficult case to prove. Actual studies upon gastro-enterostomy patients, sixty-two in all now on record show that far from its being the difficult thing to get food out of the gastro-enterostomy opening as was once supposed, as a matter of fact, it leaves by that means with great ease in every case.

In fact, it would seem, in looking at these cases with the fluoroscope, that the difficulty is of the opposite sort—that the food leaves the stomach too rapidly. The wonder is that a procedure which makes so crude a gross change in the mechanism of digestion should give such excellent results. To explain this fact, we have noted in some of the cases the fact that the jejunum below the stoma forms a sort of pouch, or reservoir which may take the function of retarding the passage of the food through the small intestine long enough



Plate 4. Case 2, thirty minutes after ingestion of the barium meal.

for digestion to be accomplished. This pouch can be well seen in the plate of Case 5

In Cases 3 and 4 and in many of the cases in the literature the stomach is not emptied exclusively by the stoma route because the stoma is not at the lowest point of drainage of the stomach in the erect position. The position of the stomach in the horizontal position that is, during the operation is not the same as when the patient assumes the erect position. This may be misleading in the placing of the gastro-enterostomy opening. Especially is this true if there is any gastropnoia. In the horizontal position the pylorus moves upward toward the diaphragm and toward the right so that the greater curvature is horizontal and above the umbilicus. On assuming the erect position the pylorus sinks to the level of or below the umbilicus and usually becomes nearly the lowest point of the stomach the greater curvature is then vertical and to the left. A gastro-enterostomy opening then placed on the posterior wall of



Plat. 6 Case 5 ten minutes after the ingestion of the bismuth meal.

the stomach at the lowest point in the horizontal position will not be at the lowest point in the erect position. We would recommend then, that in placing the opening it would be as well to place it as close to the antrum of the pylorus as possible provided the pylorus is not held high in the abdomen by adhesions. (Figs. 10 and 11)

One criticism which might be brought against our observations might deal with the character of the meal used. Cannon and Blake used canned salmon in order to have bulky food. The German observers, however, report practically the same results as ours, using bismuth and acacia paste. Furthermore the rich fermented milk we used is practically a solid food after it reaches the stomach.

We observed no vicious circles. In certain patients the duodenum between the stoma and the pylorus was seen to be full of bismuth, but no bismuth was seen re-entering the stomach through the pylorus, nor any entering through the stoma. It is difficult to reconcile the idea of a vicious circle with the idea of a



Plat. 5 Case 4, thirty minutes after the ingestion of the bismuth meal.



Plate Case of gastrectomy ten minutes after the ingestion of the bismuth meal, to show the shadow of the stomach for purposes of comparison.

high intragastric pressure due to the movements of the stomach which is so insistently emphasized by certain writers.

In order to furnish a standard of comparison we reproduce in Plate 7 the X-ray picture of a case of gastrectomy the shadow of the bismuth coming out of the stomach corresponds to the similar shadows in our pictures of gastro-enterostomy.

In reviewing the literature we were somewhat surprised to find that there were a number of cases on record on the Continent in which the bismuth meal and X ray had been used to study gastro-enterostomy. Aubourg (6) reported one case. Hirtel (7) studied 22. Hesse (8) studied 31 and Maunz (9) studied 2. There are then 56 cases in all to which we add 6—enough it would seem, for some conclusions.

The bulk of the evidence is against the conclusions of Cannon and Blake and Leggett and Maury. The great service of Cannon and Blake's work was to emphasize the necessity for making the stoma large enough and to emphasize the fact that the operation is permissible only with stenosis of the pylorus. It was largely we believe because the animals they were working on did not have an

pyloric stenosis that their results were not in accord with the results observed on human clinical material. Of Leggett and Maury's experiment we can only say that it is difficult to imagine an experiment which mimicked the actual condition which they set out to illuminate as poorly as theirs did. The subject was an animal whose trunk is horizontal so that a gastro-enterostomy would not under any circumstances be a drainage operation, the pylorus was open, there was neither ulcer, spasm or stenosis present and the food was represented by a bag of shot from which trailed a string which was anchored to the dog's pharynx.

It is perhaps permissible to say of Berg's remarkable position—that the pylorus should be occluded with every gastro-enterostomy—that the evidence which he elaborates to prove gastro-enterostomy is not a drainage operation was originally adduced by Cannon and Blake (whom he does not credit) that he describes no new experiments of his own that he refers vaguely to some good results from the operation without furnishing any case histories, and mentions very gingerly (in a footnote) the study of these cases with the X-ray.

Aubourg's patient was 44 years old and in 1900 had been operated upon by Professor Hartmann for pain after meals, and a gastro-enterostomy had been done. The X-ray examination in 1910 showed that the function of the gastro-entero-anastomosis was perfect. The bismuth left the stomach as soon as it was ingested and was shortly seen in the left iliac fossa. The stomach was practically empty ten minutes after the ingestion of the bismuth meal.

Maunz examined two cases on whom posterior gastro-enterostomy had been done. In both cases the bismuth meal left through the stoma first and then later in one case by the pylorus. So rapid was the emptying rate of the stomach that the author feels that he should warn against making too large a gastro-enterostomy opening.

Hesse studies 31 patients they were examined at periods of from 1 to 3 years after gastro-enterostomy. He states no conclusions but gives very complete protocols of the

findings with figures and plates. His findings were in no general essential different from the conclusions expressed in this and in Härtel's papers.

Härtel has a very complete and interesting review of the condition of the stomach after gastro-enterostomy based upon the study of 22 cases. The clinical results of these cases showed 16 cured, 3 bettered and 3 in whom recurrence of symptoms had occurred. They were examined with bismuth meals of milk and acacia at intervals of 4 months to 3 years after operation most of them were from 6 months to 1½ years after. He distinguishes two chief groups of the mechanism

- 1 The emptying takes place through the stoma with no drainage through the pylorus or only very slight pyloric drainage. (In all cases of organic stenosis of the pylorus duodenum, or the mid part of the stomach in cases.)

- 2 The emptying of the stomach took place both by means of the pylorus and stoma. In the majority (7) of the cases they played about an equal part. In three cases the pylorus did more than the stoma. (In all gastric ailments with a normal pylorus or callos ulcer without stenosis, with the exception of the eleventh case in the series.)

The bismuth meal after ingestion stays in the stomach and expands it. The emptying of the stomach takes place often gradually but begins earlier and is finished sooner than normally. The emptying of the stomach begins even before the stomach is filled.

The cure of a pyloric stenosis, Härtel believes never takes place but the meals keep going out through the stoma indefinitely. His conclusions are as follows:

The emptying by the stoma is not strictly due to gravity but the emptying follows the physiologic laws of the stomach itself. The active work of the stomach is taken up by the stoma and that is the preferred route and the highest intragastric pressure is over the stoma.

The good result by the gastro-enterostomy depend upon the implantation of the stoma. However when gastro-enterostomy is done no matter where one puts the stoma

one will get results the new opening though perhaps not physiologically perfect, will nevertheless play the door.

Spastic conditions of the pylorus are aided by gastro-enterostomy and the pyloric passage is re-established.

An attempt to effect the cure of an ulcer in the middle portion of the stomach by gastro-enterostomy will fail for the food will not be diverted but will reach the pylorus exactly as under normal conditions."

CONCLUSIONS

- 1 Gastro-enterostomy if properly done is a drainage operation.

- 2 After gastro-enterostomy if the stoma is at the lowest part of the stomach in the erect position the food leaves the stomach almost exclusively by the gastro-enterostomy opening.

- 3 Under these conditions the stomach is emptied with great rapidity.

- 4 Gastro-enterostomy should be done only in the presence of pyloric stenosis, or pyloric spasm due to duodenal or gastric ulcer.

- 5 The gastro-enterostomy opening should be made large and placed as close as is permissible to the pyloric antrum.

- 6 In cases where the gastro-enterostomy opening does not quite drain the stomach, the food leaves both by means of the stoma and the pylorus. Even in these cases however the stomach empties itself faster than normal.

- 7 The clinical failures after gastro-enterostomy are probably due to the cases of faulty implantation of the stoma.

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INTUSSUSCEPTION OF THE STOMACH AND DUODENUM DUE TO A GASTRIC POLYPUS

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AS far as I have been able to determine from a careful investigation of medical literature, no record so far exists of a patient who has successfully undergone operative treatment for a gastro-duodenal intussusception. The following case, therefore, appears worthy of being mentioned.

On the evening of June 20, 1912, I received a telephone message from Dr. Miller of Tranent, and was asked to meet him in consultation with his colleague Dr. Johnstone about a case he took to be suffering from acute intestinal obstruction. The patient was a married woman 48 years of age who had been more or less an invalid for about a year and had been previously operated on in the *Royal Infirmary of Edinburgh*, when gallstones had been removed from the gall-bladder. When examined by us the healed scar of the wound made at that operation was visible and to the right of it a tender palpable swelling could be made out that felt like a distended gall-bladder. There was a certain degree of abdominal distention. A detailed history of her illness is appended in which it is recorded how the patient had been subjected to attacks of vomiting due to what had been taken to be partial intestinal obstruction. The present attack, however, was much more serious than any previous one and he was now in a critical condition. An operative treatment was immediately indicated this was undertaken, and the provisional diagnosis made was intestinal obstruction probably due to adhesions in the neighborhood of the gall-bladder. The swelling was accounted for by distention of the gall-bladder the result of a recurrent cholecystitis. When the abdomen was opened by a vertical incision to the right of the former scar the gall-bladder was found united to the abdominal parietes and showed no evidence of recent disease. The swelling, which had been palpated was observed, on throwing up the transverse colon, to be due

to a distention of the upper six inches of the jejunum by a recent intussusception.

This distention was visible up to the duodeno-jejunal junction and could be felt to extend within the duodenum. It was obviously an intussusception and was easily reduced within the duodenum by manipulation. The appearances seen at this stage of the operation are indicated in the accompanying drawing (Fig. 1). In order to determine the site of origin of the invagination the stomach and commencement of the duodenum were now examined and the appearances seen are illustrated (Fig. 2). This drawing demonstrates the deep puckered invagination of the stomach wall at the site of its origin, and shows the duodenum distended tightly by the intussusception which had been partially reduced the apex being now situated at the commencement of the third part of the duodenum. The intussusception was now completely reduced by manipulation. This was however a much more difficult proceeding than at the first stage where it lay within the jejunum as the duodenum was very tightly distended. When the reduction was completed there was felt within the pyloric antrum of the stomach a somewhat pedunculated tumor the size of a duck's egg. The invagination had originated here and this tumor had formed the apex of the intussusception. During the examination and subsequent manipulations the lower border of the pancreas was found to be separated from the duodenum by an unusually wide interval, and this portion of gut was exceptionally mobile. The portion of stomach invaginated was found to be obtained to a large extent from the fundus the pylorus was visible and was situated at the margin of the ensheathing coat of the intussusception but was not drawn within the ring.

The tumor was now excised along with the portion of stomach wall to which it was attached, and the operation completed in the usual manner.

The patient made a rapid and most uneventful recovery.

DETAILED RECORD OF THE CASE

The patient was a married woman, 48 years of age, with a healthy grown-up family. The story of her illness can best be commenced in the early summer of 1909. Up to that time her health was good, but in the middle of the month of May she suddenly became ill and was admitted to the Royal Infirmary of Edinburgh under the care of Mr. Miles. From the record of her case taken at the time which Mr. Miles has kindly allowed me access to and has permitted me to publish I learn that three days prior to admission she was suddenly seized with severe pain in the lower part of the abdomen and vomiting. It is recorded so that pain has lasted ever since and she has been sick on both the last 3 days. The pulse has been regular but for the past week she has noticed her stools to be pale in color than is usual. She has had previous attacks of pain shooting up to her shoulder but no history of chronic jaundice and has been troubled with indigestion but no pain after food. There has been no difficulty in micturition.



Fig. Gastro-duodenal intussusception, showing lower part of intussusception within the commencement of the jejunum.

When examined on admission there was no palpable swelling but very marked tenderness over the right side of the abdomen—the hypochondriac and lumbar regions. The abdomen was rigid all over the right side. The patient's complexion was slightly tinged with jaundice.

On the day following examination the stools were observed to be clay-colored. She is described as having an anxious look. The tongue was furred but moist. Her previous health had been satisfactory except for several attacks of pain which usually radiated to the right shoulder.

On the day following admission Mr. Miles operated under chloroform anesthesia and opened the abdomen through the right rectus muscle. On examining the appendix it was found to beutely flamed and surrounded by a small quantity of pus contained within limiting adhesions. The appendix was removed and the gall-bladder explored and as it contained stones it was opened and a quantity of clear fluid escaped. Its numerous yellow faceted gall-stones, as large as flow the size of the duct was opened. The gall bladder and cystic duct were drained.

After the operation the patient's convalescence was rapid and she returned home on the 6th of June with the wound virtually closed.

According to the notes of her case provided me by Dr. Johnstone who attended her at home I find that she remained well for seven weeks thereafter. Thereafter there supervened sickness and feeling of nausea accompanied by pain in the stomach and tenderness over the epigastric region with vomiting. Such times recurred the pain which was of tearing character.

She returned to Mr. Miles' care again on 4th of August owing to an especially severe attack which

had come on at 8 A.M. on the morning of the 3rd, when the patient being out of bed at the time was seized with severe pain in the abdomen below the right mamma. This pain radiated up towards the scapula and across the front of the abdomen to the opposite side. The patient vomited five minutes afterwards, and continued to do so all day and night at frequent intervals. She was twice sick and according to the ward records the vomit is described as watery. She had no attacks of hiccough. The patient stated that she had been told by her friends the day before admission to hospital that her complexion was of yellowish color.

When examined in hospital on this occasion, the epigastric region was slightly rigid and was tender to touch. She was detained in hospital for a week, during which time she improved rapidly the pain and vomiting having ceased entirely. She was sent home with instructions to report at intervals, no operative treatment having been carried out.

After returning home she began light housework again, and found that she had to restrict her diet, as her stomach was easily upset. She found it necessary to cease taking food altogether for days at a time. Even with this precaution there was considerable retching with gaseous eructation and a varying degree of pain. At intervals of a week or ten days her health would elapse, during which time she could take more liberty as regards the variety of her food, but at the end of that period the former symptoms would reassert themselves with more or less severity.

According to Dr. Johnstone's notes from which the above facts are obtained, as a general rule the fact might be stated that with rest in bed, enemata to evacuate the bowels, and fluid diet her condition would undergo some amelioration but she was never



Fig. 4. Gastro-duodenal intussusception after partial reduction, showing packed invagination of stomach, and intussusception within duodenum.

absolutely free from symptoms referable to her digestion with the exception of a period of six weeks at the beginning of this year. For the next three or four months after that period she had the varying health such as already described. About the beginning of this year her condition became much worse. The nausea was constant vomiting became very much more urgent, necessitating entire disallowance of all food by the mouth and it even manifested itself half an hour after taking sips of water. Much more material was voided from the stomach than was ingested, and although not unequivocally fecal in character partook somewhat of that nature. Pain started along with vomiting and their severity increased in equal proportion, but the pain would continue for some time after the vomiting ceased. There was no hematemesis present at any period of the illness. Constipation was a constant feature throughout her whole history.

On examining her abdomen during this acute exacerbation fullness could be seen above the umbilicus, in the epigastric and inner part of the right hypochondriac region, and on continued examination peristaltic wave was evident travelling small from right to left. On palpation this swelling was sausage like, soft to touch, and easily

defined, and corresponded as far as could be judged to the transverse colon both in position and appearance. A copious enema was given and good result having followed, the bowel being evacuated twice, the swelling was not nearly so evident as it was at first, although it could still be felt in the same position. The condition was thought, therefore, to be probably band causing partial intussusception of the transverse colon, but no certain diagnosis was possible. The band was accounted for by an omental adhesion remaining after the previous operation on the gall bladder.

These attacks continued to recur with an increasing frequency so that by the 20th of June, despite rest in bed and the treatment described, her condition of health had become critical, and when examined by us on the evening of that day her pulse was 96 per minut — small, thready and slightly intermittent. Her eyes were sunken, and the characteristic abdominal facies was evident. There was mild degree of wandering. The temperature that had never varied much from the normal was now slightly subnormal.

The physical signs revealed on examining the abdomen have already been described, and the operative treatment detailed.



Fig. 3. Pedunculated myoma of stomach removed by operation (natural size), showing small ulcer of mucous membrane over vertex of growth.



Fig. 4. Pedunculated myoma of stomach, on section (natural size) showing structure.

PATHOLOGICAL REPORT ON THE GASTRIC TUMOR REMOVED BY OPERATION

The tumor is of oval contour and measures 6 centimeters in length, $4\frac{1}{4}$ in breadth, and $3\frac{1}{2}$ in height.

It has a broad pedunculated attachment to the wall of the stomach, a portion of which has been excised with it. It is covered by congested mucous membrane and a small circular ulcer has eroded the mucous membrane over the summit of the tumor. The mucous membrane is loosely attached to the tumor except over its vertex (Fig. 3).

On section the tumor is seen to have originated from the muscular coat of the stomach. The growth is covered by the mucous membrane that is thinned over the summit, and the submucous tissue and capsule of the tumor are seen as a clear broad white line surrounding the tumor. The growth is of a firm but fleshy consistency and closely resembles the appearance of the ingrowth in an intra-canalicular fibroma of the female breast. Fig. 4 shows the appearance on section.

Stroscopical examination shows the tumor to be a fibromyoma growing from the muscular coat of the stomach enveloped in a fibrous capsule and covered by a loose layer of mucous membrane the glandular element of which has been altered slightly by the pressure of the growth.

COMMENTARY ON CASE

A review of this case will reveal a clinical picture of disease that is distinct and definite

The initial stages are slightly obscured by the attack of appendicitis and cholelithiasis for which she was treated. If the tumor was present at this stage and occasionally prolapsing through the pyloric orifice as is possible its detection would have been most difficult, and even if it had been discovered it is unlikely that any surgeon would have felt justified in adding the operation of gastrectomy to a case already undergoing treatment for suppurative appendicitis and gall stone disease.

The gastric crises from which she suffered are to be explained by the occlusion of the pyloric orifice by the new growth. The slight jaundice can be accounted for by the prolapse of the tumor into the duodenum, where it mechanically occluded the outlet of the bile passages or by its presence caused duodenal catarrh and catarrh of the ducts. It is unlikely that this prolapse persisted the total rest of the stomach that produced ultimate relief from the severe discomfort probably allowing a natural devagination to take place the violent muscular contraction of the severe vomiting would probably help towards the same end.

The unnatural mobility of the duodenum and its loose connection to the pancreas possibly were of congenital origin but more than likely were an acquired result of the repeated prolapse of the tumor and stomach wall into the above mentioned canal. In any case it must undoubtedly have facilitated the further descent of the intussusception.

The history of the last half month of the

patient's illness strongly suggests that incomplete replacement had occurred during that period. The history of the last two days is that of total obstruction and partial devitalization of the entrant gut.

With a clinical picture so distinct and a treatment so easy and offering so excellent a prospect of a permanent cure, it is worth while inquiring into the possible frequency of such an occurrence and the recorded cases of a similar nature.

As was mentioned at the commencement of this article I have been unable to discover the records of any case similar to this in literature, although a careful search has been carried out. It seems unlikely however that the case is one of unique incidence.

BENIGN TUMORS OF THE STOMACH

The majority of innocent tumors of the stomach tend ultimately to develop towards the inner surface. They are usually sessile when of small size but become pedunculated as growth proceeds.

Classification. If classified according to their histological structure adenomata, fibromata, lipomata, and myomata have been met with forming gastric polypi. According to Fenwick, the so-called mucous polypus is really a small adenoma which has undergone cystic degeneration.

Adenomata. These tumors are usually multiple and vary in number from 2 to 3 to over 100. They are most frequently small of uniform size and distributed irregularly on the surface of the stomach. They are sometimes sessile but are usually pedunculated. These tumors are formed by hypertrophy of the glands which are occasionally dilated to form small cysts. They are considered by certain writers as an indication of a chronic inflammatory condition of the stomach, a polypoid gastritis.

Besides these glandular polypi, which are small in size there are others in which the connective tissue element is strongly developed, and the tumor attains a considerable size. Cornil has recorded a case where such a polypus, 5 cm. long by 3 cm. broad was ovoid and pedunculated, and obstructed the pylorus. Chiari has likewise reported a case of a large

polypus which obstructed the pylorus. Chanut removed a polypus the size of the head of a fully developed fetus. Tuffier figures one which is contained in the collection of the Dupuytren museum. This tumor is 10 cm. long, and was strangulated in the pylorus (Fig. 5.)

In one instance which came under the observation of Fenwick, four pedunculated adenomata each as large as a pigeon's egg, were found attached to the margin of the pyloric ring and had produced partial obstruction of the orifice.

Ebstein met with 14 cases of polyadenomata in 600 necropsies (2.3 per cent). According to statistics compiled in London they do not exceed 2 per cent. Out of 34 cases collected by Fenwick from various sources, the tumor was solitary in 14 multiple in the remaining 20.

Fibromata. These are either single or multiple. They usually occur in the pyloric end of the stomach (Fenwick). As a rule they are elongated or club-shaped and measure from one to four inches in length (Bernabef) (Fig. 6).

Lipomata. These are rare tumors, of small size sometimes multiple. They have been described by Virchow von Ruedorf Benaky. They are most commonly situated in the central portion of the stomach, on its anterior wall.

Myomata and fibromyomata. These tumors when pedunculated take the form of firm, rounded tumors which vary from the size of a pea to that of a cherry and are attached to the wall of the stomach by a thin pedicle. They may be single or multiple and are usually situated in the pyloric region (Fenwick).

Myoma of the stomach was first described by Morgagni in 1762 since which time more than 40 other cases have been recorded (Fenwick.)

As a rule it takes the form of an oval or round, firm, solitary tumor situated near the cardiac orifice or at the greater curvature but it is sometimes encountered in the pyloric end of the stomach or in the duodenum (Wessner). The tumor is usually of slow growth and tends to become submucous or subserous.

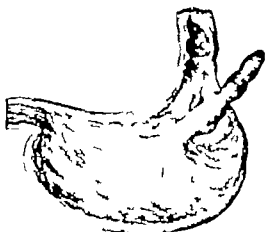


Fig. 3. Gastric polyp, causing pyloric obstruction (after Tauffer)

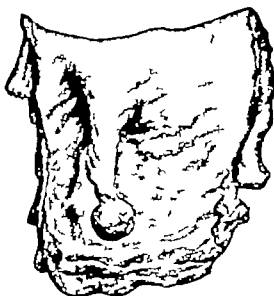


Fig. 4. Gastric polypus. A pedunculated fibroma with long pedicle natural size, (after Fenwick)

the former are prone to undergo cystic degeneration and to become pedunculated while the latter occasionally assume a sarcomatous character (Brodowski).

Without being pedunculated they may produce the symptoms of pyloric stenosis, as shown by Pernice and Herold. In Klemick's case ulceration of a myoma caused death from hemorrhage.

✓ Erlach removed a myoma from the stomach which weighed 5400 grammes. ✓ Eiselsberg one about the size of a man's head and Kunze a lipomyoma 351 grammes in weight.

SYMPTOMS

Where a pedunculated benign tumor of the stomach is situated in the pyloric region of the stomach gastric phenomena are almost always present. These are mainly to be accounted for by the ball valve action of the tumor at the pyloric orifice. Sudden and violent attacks of retching and vomiting which persist for a few minutes to several hours may develop and in these cases there is usually a polypus of considerable length, the free extremity of which is occasionally prolapsed through the pyloric valve and suffer temporary strangulation (Fenwick.)

Between the attacks the patient frequently enjoys good health. In such cases the tumor presumably possesses a long pedicle and when

not producing a temporary pyloric obstruction permits of free escape of the stomach contents. The stomach may become dilated when the obstruction is more permanent and the patient has persistent ill health with more acute and more serious sudden exacerbations. Pain after food, flatulence, acidity and vomiting with sudden attacks of severe epigastric pain and vomiting are experienced. Sometimes the vomit may be blood-stained from ulceration of the tumor or gastric wall. The latter may perforate as in the case recorded by Cleghorn. Loss of flesh, anorexia and cachexia may develop so that the case is taken to be one of cancer of the stomach, and the patient may die from exhaustion.

Gibson describes a case of ball-valve tumor of the stomach that was removed by operation from a man aged 64 who had suffered from gastric symptoms of some years duration which in conjunction with the objective signs were considered indicative of carcinoma of the stomach.

On opening the stomach an innocent polypus was found which sprang from just inside the pylorus and had a ball valve action.

Blake has recorded a similar case due to a pedunculated adenoma.

Beardley has described a case where spontaneous detachment of a gastric polypus occurred and it was vomited by the patient.

Fatal hemorrhage may result (Ellison)

Intussusception apart from the case already described, would not appear to have been considered as a possible complication of gastric polypus. Collier has, however, recorded a case where it developed from polypa in the duodenum.

The case was that of a young man aged 31. His illness commenced about 12 months previously with pain across the upper part of the abdomen and vomiting. The symptoms increased in severity during the last six months until one evening he was suddenly seized with more than usually severe pain and vomiting. The following morning a distinct tumor could be made out running obliquely across the abdomen from right to left. On opening the abdomen a large intussusception was found commencing a few inches from the pylorus. The patient sank a few hours after operation. At the post mortem examination an enormous number of polypa were found varying in size from a pigeon's egg to a pea. They were scattered throughout the stomach and small intestine the greatest number being in the duodenum and upper part of the jejunum. The specimen which is now in the museum of the Royal College of Surgeons of England shows the large lobulated villous growth situated in the duodenum, a short distance from the pylorus. This had a constricted attachment to the mucous membrane and was the starting point of the intussusception of the bowel.

CONCLUSIONS

1. Benign tumors of the stomach are of occasional occurrence. The majority of these ultimately come to project within the gastric chamber and become pedunculated, forming gastric polypa.

2. These polypa when situated adjacent to the pyloric antrum, ultimately produce

occlusion of the pylorus by a ball-valve action.

3. This is indicated by the signs and symptoms of acute pyloric obstruction.

4. The obstruction is usually intermittent, and the patient has intervals of good health.

5. A natural cure may result by separation of the polypus from tension or strangulation of its pedicle.

6. A fatal issue may ensue from such complications as hemorrhage perforating ulcer or profound debility.

7. A gastric polypus may produce a gastroduodenal intussusception, reaching as low as the upper part of the jejunum.

8. Where gastric polypa are diagnosed by their clinical indications or recognized by the gastroscope in the region of the pyloric antrum their removal by operation is indicated.

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ILEO-APPENDICULAR HERNIA OF THE APPENDIX

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AS an introduction to the report of this case it may be interesting to the members of this society to briefly review the literature upon the subject of ileo-caecal fossae in general and the ileo-appendicular fossae in particular.

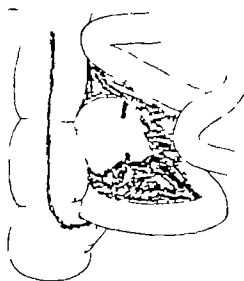
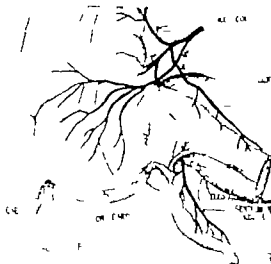
Historical. In 1775 Santorini (1) of Parma was the first to describe and illustrate fossae in the ileo-caecal region. No further mention is made of them until Huschke (2) in 1834 described two fossae bounded by three folds brought out by traction on the vermiform appendix, which correspond in a general way to the more recent and thorough descriptions of the ileo-appendicular fossae—the superior fossa of Huschke—and the fossa of the mesentery of the appendix—the inferior fossa of Huschke—the recessus caecalis of Waldeyer (3) Treitz (4) whose epoch making work was published at Prague in 1857 on retroperitoneal hernia, first recognized that these herniae occur in fossae which are normal and gave us at that time the first intelligent description of these fossae. He added to the two pericaecal fossae of Huschke a third, or sub-caecal, lying behind or below the caecum. In 1861 Luschka (5) added to these three a fourth above the ileo-colic junction. In 1868 Waldeyer in a very thorough description of these fossae classified them as follows:

1. Recessus ileo-caecalis superior or fossa of Luschka
2. Recessus ileo-caecalis inferior or the upper fossa of Huschke
3. Recessus caecalis, or the lower fossa of Huschke
4. Recessus subcaecalis, or fossa of Treitz.

In 1870 Hartmann (6) a pupil of Luschka, described three fossae: ileo-caecalis superior, ileo-caecalis media, ileo-caecalis inferior (not previously described) omitting the sub-caecalis. In 1885 Treve (7) in his Hunterian lectures on the anatomy of the intestinal canal and peritoneum in man, described the

superior and inferior ileo-caecal fossae thus adding his quota to the confusion in the nomenclature of this comparatively simple subject. His chief contribution to the study of these fossae however was his theory as to the origin of his "bloodless fold (the ileo-appendicular fold) which aroused considerable discussion and eventually was proven quite conclusively to be erroneous, as will be shown later. In 1887 Tuffier (8) in writing upon the caecum and its herniae, added nothing new to the description of the fossae but showed the influence of the superior and inferior ligaments of the caecum in maintaining its normal position and relations. To the exhaustive work of Jonnesco (9) on internal retroperitoneal hernia published in 1890 at Paris we are mainly indebted for our present conception of the pericaecal fossae and the substitution of a saner nomenclature for the earlier most confused one. He describes an ileo-caecal fossa, an ileo-appendicular fossa and two retrocaecal fossae an internal and external. Brucke's (10) work, appearing in 1898 at Berlin confirmed that of Jonnesco but mentioned the fossa of Hartmann as exceptional. An English publication on this subject by Lockwood and Rolleston (11) appeared in 1892 and a more complete work by Berry (12) in 1897 founded largely on the investigations of Jonnesco. In the same year Moynihan in the Arris and Gale lectures delivered at the Royal College of Surgeons of England, gave an exhaustive survey of the anatomy and surgery of the peritoneal fossae under the title of "Retroperitoneal Hernia." This work was revised and in part rewritten by his colleague, J. F. Dobson in a folio edition in 1906 and can be heartily recommended for its clear and comprehensive treatment of this interesting subject.

Dropping all the confusion of the past, we will therefore adopt the classification of Moynihan for pericaecal folds and fossae which is as follows:



The *primary* folds are

- 1 The ileo-colic (or anterior vascular) fold.
- 2 The accessory ileo-colic fold.
- 3 The ileo-appendicular fold.
- 4 The meso-appendix (or posterior vascular) fold.

The *fossae* formed by these are

- 1 The ileo-colic fossa.
- 2 The accessory ileo-colic fossa.
- 3 The ileo-appendicular fossa.

The *secondary* folds formed by secondary physiological adhesion of the ascending colon to the posterior abdominal wall vary greatly depending upon the time such coalition between the colon and caecum with the posterior abdominal wall takes place. Two folds are quite constant, (a) the parieto-colic and (b) the mesenterico-parietal, forming the retrocaecal fossae. Sometimes there is a third fold between these two making an outer and inner retrocolic fossa. A fourth fossa *infracaecalis* described by Biesiadecki (3) is sometimes found and is of occasional surgical importance because of hernial protrusions of the small intestines into it followed by strangulation. It is a hernial protrusion of the peritoneum behind a sharp band formed at the junction of the lower upper half of the iliac fascia with the rigid lower half.

In this paper we are interested with the ileo-appendicular fossa. As this fossa differs

somewhat in its formation from the other primary fossae and as its mode of origin has given rise to considerable discussion, it may be well to refresh our memory concerning the anatomical points involved. The ileo-colic fossa and the accessory ileo-colic fossa are dependent for their formation upon the branches of the ileo-colic artery, the ileo-appendicular fossa only partially so. The main extension of the ileo-colic artery passes anteriorly to the ileo-colic junction forming the edge of the ileo-colic (anterior vascular) fold and the anterior rim of the ileo-colic fossa. The appendicular artery usually passes posteriorly to the ileum. At the lower border of the ileum it gives off one of its chief branches, which passes first downward and to the right, then curving upward in an anterior direction. It passes inward and to the left, forming the edge of the ileo-appendicular fold or "bloodless" fold of Treves. It thus forms the anterior edge of the opening into the ileo-appendicular fossa.

The *ileo-appendicular fold* (superior ileo-caecal fold, Waldeyer, Tuffier, bloodless fold, Treves, ileo-caecal fold, Lockwood and Rolleston, Kelymack and Berry, ileo-appendicular fold, Jonnesco, Juvvara). Moynihan considers the name suggested by Jonnesco (ileo-appendicular fold) as describing most accurately the origin and attachment of the

peritoneal fold and as one so distinctive as to avoid any likelihood of confusion. "The fold extends from the lower border of the ileum—that directly opposite the line of the mesenteric attachment—to the anterior surface of the meso-appendix. It is quadrilateral in outline. The upper border is attached to the ileum for an extent which is extremely variable. An average length will be between $1\frac{3}{4}$ to $2\frac{3}{4}$ inches. The lower border extends from an angle formed by the appendix with the cecum inward on the anterior surface of the meso-appendix along a line which is almost parallel with the superior border when the appendix is straightened out. Sometimes this line of adhesion is shifted to the appendix itself. Its outer or right border is attached to the inner aspect of the cecum as far down as the root of the appendix. Its left or inner border is concave to the left and free. This edge contains the recurrent or ileo-appendicular artery given off almost immediately below the level of the ileum from the main appendicular. From its origin the little vessel runs slightly downwards and outwards in the meso-appendix, and then, turning, it forms an arch with the convexity downward and to the left as it runs upward to the ileum between the layers of the ileo-appendicular fold."

Besides the artery and veins this fold also holds between the two layers of the peritoneum some muscular fibers, first noticed by Luschka in 1861 which are continuous with the longitudinal fibers of the ileum and cecum. Luschka considered that this fold acted as a regulator between the ileum and the cecum, keeping a proper and advantageous relative position for these two viscera. The presence of these muscular fibers in the ileo-appendicular fold marks a difference in this fold from the other peritoneal folds and has led to considerable discussion as to its real origin.

Waldyer first demonstrated that the ileo-colic (anterior vascular) fold and the meso-appendix (posterior vascular) fold owe their origin to the lifting up of a peritoneal reduplication by each of the vessels running from the ileo-colic artery to the cecum and appendix the extent and development of

these folds being entirely and solely dependent upon these vessels being in fact vascular folds. The origin of the ileo-appendicular fold however has not as yet received any entirely satisfactory explanation. Huntington (14) from a study of the comparative anatomy of the alimentary canal of apes points out that the vascular folds vary with the freedom of the colon and cecum, but the intermediate (ileo-appendicular) fold is of good size in all, though varying in the position and extent of its attachments. Treves, from a similar study concludes that the intermediate (his bloodless) fold is the remains of the earlier posterior vascular fold or true mesentery of the appendix, the meso-appendix as found in man being a substituted mesentery. Lockwood and Rolleston rather agree with Treves, but Jounesco holds that the meso-appendix is the true appendicular mesentery and the ileo-colic and ileo-appendicular folds are the mesentery of the cecum. Berry agrees with this because of the established fact that the meso-appendix is the only constant fold. He considers that the appendix is gradually replacing the cecum in functional activity because the meso-appendix is the largest, the most constant, and the most vascular of the three. On the other hand, Luschka and his pupil Hartmann held that the ileo-appendicular fold is produced by the raising up of the peritoneum by muscle fibers already referred to extending across the inferior ileo-cecal angle. Toldt in 1879 elaborated this theory and considered, because this fold contained practically no blood vessels and because the muscular fibers producing the fold only appeared at the end of the fifth month, while the anterior and posterior vascular folds are to be seen in the fourth month that it was a portion of the peritoneum detached from the cecum. These authors hold that the fold is muscular in origin.

Moynihan believes that the theory of Treves is without evidence and wholly untrue. Combining the ideas of Luschka and Brödelke he considers the true explanation to be both muscular and vascular. He says: "If an embryo of the fourth month be examined it will be found that, at the point of budding where the cecum is developing an artery

(the ileo-colic) supplies two branches to the bud, one anterior the other posterior. These two vessels lie on the surface of the gut immediately beneath the layers of the peritoneum. As the cecal bud increases in size, sprouting away from the mesenteric attachment, it would drag its vessels with it but the cecal growth is more rapid than the vascular. The result is that the vessels seek a short path and run straight to their destination instead of following the outline of the gut. In doing so they pull up and drag upon the peritoneum in their neighborhood, and so lead to the formation of two distinct plicae, the anterior and posterior vascular folds already referred to. At the end of the fifth month when the cecal bud is easily recognizable there is seen, in between the ileum and the caecum, the intermediate fold already developed and it contains between its layers the bundle of muscle fiber above mentioned. Now from the posterior or dorsal vessel running in the posterior vascular fold, a branch is given off which, running in a curved direction, mounts upward eventually to the ileum. This is the ileo-appendicular artery which lies in the free edge of the ileo-appendicular fold. The later development of this fold, then, it would seem, depends upon the vessel in its free margin. This theory therefore looks upon the ileo-appendicular fold as of a twin origin. It is a compound fold. Primarily it is muscular dependent upon the ileo-appendicular muscle. Later its development is modified by and attributable to the ileo-appendicular artery the recurrent branch of the main appendicular vessel. This being the case, the ileo-appendicular fold is, in part at least, secondary to and dependent upon the posterior vascular fold the meso-appendix. It is the last fold to appear in the embryo, less constant than the meso-appendix, and receives its vessel (upon which it to some extent depends for its existence) from the posterior vascular fold. It cannot, therefore be the primitive mesentery of the caecum."

The ileo-appendicular fossa. Having now a clear understanding of the origin and location of the fold, the fossa is found between it and the meso-appendix, its size depending mainly upon the size of the fold.

Pathology. This fossa is subject to two pathological conditions, cysts and hernia. By the closure of the mouth of the fossa, cysts the size of a lemon have been observed occupying the site of the fossa. As to hernia into this fossa, either the small intestine or the vermiform appendix may become lodged in it. Moynilhan has reported seven cases. Careful and thorough search of the literature of all cases of retroperitoneal hernia fails to add a single case to his list brought up to 1906.

Etiology. Dr. Nassie (15) reporting his case in 1896, in discussing the causes which lead to the formation of such herniae mentions (1) Brödicke's leaning to a mechanical theory that it depends upon the relation between the size of the opening of the fossa, the firmness of the edges of the opening, and the abdominal pressure (2) Jonnesco's theory that the appendix becomes caught by adhesions to the iliac fossa together with the neighboring ileum which thus becomes an entering wedge for the admission of other portions of the intestines (3) Tuffier's belief that an unusual fullness of the intestines, supplemented by an increase in the intra-abdominal pressure, would force the intestinal loops into the fossa. Probably all three enter into the development of a hernia.

Ileo-appendicular hernia of the appendix. Hernia of the appendix into the ileo-appendicular fossa has been studied by C. B. Lockwood alone of all surgical writers. His first observations were made on the cadaver and were first given to the profession in 1889 in his Hunterian lectures on hernia. In 1890 in the Transactions of the Pathological Society London, vol. xli p. 118 in an article on retroperitoneal hernia of the vermiform appendix, he quotes two cases apparently non-pathological found in autopsy dissection. In both the vermiform appendix was thought to be absent. In one a vermiform appendix two inches long, was discovered lying in a small blind pouch which ran behind and parallel with the ileum. There seemed no doubt that this pouch was an ileo-caecal (now more specifically called ileo-appendicular) fossa. In the second the author simply states that the hernia took place into one of the ileo-caecal fossae. As he quotes Lichen

stern, who classifies the ileo-caecal fossae into recessus ileo-caecalis, recessus ileo-caecalis superior and recessus ileo-caecalis infima, this case can reasonably be placed in the more recent classification as a case of hernia of the vermiform appendix into the ileo-appendicular fossa, making two of this variety quoted by him. The chief interest in this last specimen, says Lockwood, lay in the fact that the vermiform appendix, lying only partially herniated into this fossa, almost completely disappeared when the cecum was pulled downward thus throwing light upon the mode of formation of these anomalies.

He refers to an article by Lichenstern (16) in Ziemssen's Cyclopaedia of Medicine, where three cases of retrocaecal hernia of the appendix are cited, two of which were strangulated but on looking up Lichenstern's article we find that these were retroperitoneal herniae but not of the vermiform appendix. Lockwood in this early publication concludes that retroperitoneal hernia of the vermiform appendix may occur into either the subcaecal or ileo-caecal (ileo-appendicular) fossae further that it may be either partial or complete and, lastly that the mouth of the fossa may become completely closed.

As causative factors, Lockwood thinks these herniae may be either developmental or pathological. In the first alternative, whilst the subcaecal fossa is being formed during the descent of the cecum, the appendix may become immured within it as is suggested by the case of partial hernia mentioned above. In the second the appendix may be imprisoned in the fossa during the displacement of the cecum and iliac peritoneum which is caused by the formation of a large hernial sac, such as has been described. It, however seems to me that this is very uncertain and cloudy reasoning. Finally he says, it is possible to conceive that the appendix itself might by its own movements find its way into a retroperitoneal fossa which had been previously formed in the ordinary way.

Surgical aspects. In 1901 Lockwood develops the surgical aspects of this form of hernia of the appendix in a book entitled *Appendicitis, Its Pathology and Surgery* (17) and writes as follows "The vermiform appendix

may be herniated into either the ileo-caecal or subcaecal fossa but the former position is much the more common. The mouth of the ileo-caecal fossa is situated at the ileo-caecal angle, and is seen when the ileum and cecum are lifted up. It runs upward behind the ileo-caecal junction and parallel to the right colon. This fossa may be as long as three inches and easily admit the finger or a loop of the intestine. I have several times found the inflamed appendix in the ileo-caecal (ileo-appendicular) fossa. When the hernia is but partial the appendix is easily found and with drawn, but when the hernia is complete and the mouth of the fossa closed, the greatest difficulties may arise. It is possible that accumulations with their attendant troubles are more likely to occur within herniated appendices."

He cites two cases. One (No 28, p. 113) was a complete hernia described as follows.

The appendix could not be discovered at the ileo-caecal angle beneath the cecum, or in the pelvis. Something hard was felt along the inner edge of the right colon. Some years before I had given attention to retroperitoneal hernia of the vermiform appendix. I had also in conjunction with my friend Mr Rolleston, investigated the anatomy and positions of the vermiform appendix (11) with the result that I am convinced that the vermiform appendix is never absent except as the result of disease. I have also learnt that it is not infrequently hidden away in either the ileo-caecal or subcaecal fossa and that the mouth of the fossa may become occluded and be most difficult to find. Being unable, therefore (in this case) to discover the vermiform appendix in any of its usual situations, I began to seek for it in the ileo-caecal and subcaecal fossae. When the cecum was raised the peritoneum beneath looked perfectly smooth and without a trace of any fossa. A swelling of the most doubtful nature was felt beneath the commencement of the right colon. At length a delicate streak was observed running across the peritoneum of the iliac fossa close to the attachment of the ascending colon. A little pulling apart with dissecting forceps showed that this was the mouth of the fossa, within which the appen-

dix lay concealed and from which it easily turned out.

The other case (No 33 p. 125) was only a partial hernia. The appendix rose from the inner side of the cecum and ran downward for about 2 cm. where it was bent at an acute angle to disappear into the ileo-caecal (ileo-appendicular) fossa. About 5 cm. more of the appendix was pulled out of the fossa where it had coiled upon itself. The last 2 cm. of the appendix was as hard as India-rubber and resumed its curve after it had been straightened out. The ileo-caecal (ileo-appendicular) fossa was from 4 to 5 cm deep and would just admit the first two joints of the index finger.

He also mentions a case of acute strangulation of the appendix in the ileo-caecal (ileo-appendicular) fossa described by Mr. Henton (18). The appendix, 5 inches long, was quite free and natural in appearance except for its distal end. This was tightly strangulated in a peritoneal sac which passed upward behind the junction of the ileum with the cecum. This ileo-caecal pouch had a smooth rounded orifice and was about the size of a walnut. The patient had been ill for five days with acute abdominal symptoms marked by recurring attacks of severe colic, collapse, and vomiting."

The further search of the literature for this particular type of retroperitoneal hernia has been very trying and difficult because all retroperitoneal hernia had to be looked up read and stricken out lest an ileo-appendicular hernia of the appendix might have been included with other retroperitoneal hernia; all hernia of the appendix had to be sought for that a retroperitoneal variety might not be overlooked and lastly the nomenclature of these pericecal hernia has been so confused that all possible varieties had to be searched out for fear that this particular form might be included under some other heading. After a most careful search only two other cases were found which might be included in our list, and these two are very doubtful.

Elliot (19) in 891 reported an appendix being found in the ileo-caecal fossa. His description is that the appendix was found

embedded in adhesions, winding around under the cecum in a fold of the peritoneum which Treves describes as an ileo-caecal fossa. Apparently this was in the retrocecal fossa, and should not be classified with our cases. He however cites a dissecting-room case of Mixter where the appendix was actually lying in an ileo-caecal fossa, differing only slightly from the one described by Treves. This, if admitted, would be the third dissecting room case. In 1905 A. C. Wood (20) of Philadelphia reported a case of transmesenteric hernia of the appendix, but his description does not state through what mesentery the appendix herniated—whether he referred to the mesentery of the ileum or to that of the appendix itself. This I attempted to have cleared up by a statement from him but could get no answer. If he referred to the mesentery of the ileum it was very similar to my own case about to be reported.

Murphy (21) refers to the possibility of such hernia but cites no cases. He says "The appendix may be lodged in either of two of the pericecal fossa (retroperitoneal hernia of the appendix). In many cases it can be readily extricated in others the orifice of the fossa becomes closed by adhesions and the organ is found with the greatest difficulty. It is believed that inflammatory phenomena are more likely to originate in such herniated appendices, in which case the abscess is essentially retroperitoneal. Hernia of the appendix is more frequent into the ileo-appendicular fossa than into the subcecal or retrocecal. This is also Lockwood's opinion but, judging from the reported surgical cases, I have not found this true.

To these I wish to add the following case:

Yoshida, Japanese laborer, 36 years old, unmarried, entered St. Luke Hospital October 5, 1905 from him obtained the following history: Family and previous history negative as to les bearing upon the present illness. Twenty days before the present trouble began with severe pain in the right side of the abdomen in the ilia region. After three or four days the pain subsided, only to come on again 14 hours more or less to the end of week, continuing to the time of admission. He never had had any previous attack, and this one was unaccompanied by vomiting or diarrhea, chills or

lever. Examination showed him to be thin but very muscular with normal heart and lungs. The right rectus was rigid and there was tenderness over both sides, most marked over McBurney's point. N. tympany. Pulse 56, temp. 97. Blood count H. 90 reds, 4,750,000 whites, 0.400 polymuclear, 84 large mononuclear, 9 small. He was operated upon October 6, 1911 under nitrous oxide and ether. Kammerer incision and abdomen opened. A mass the size of a small lime could be felt which was very freely movable. This was isolated from the general cavity by single layer of abdominal pads without much exposure of the general viscera. This mass was believed to be on the inner side of what was considered to be the cecum, but it was at once noticed on searching for a line of cleavage that the usual ease of finding such a point of attack was absent. The most probable point, at the junction of the mass with the bowel wall, was therefore opened and pus soon found. An abscess about the size of a walnut was opened and a dram of pus wiped out, and the cavity sterilized. The entire mass being so small and so circumscribed, it was decided to remove the appendix. Ligatures were passed for this purpose at the upper border of the mass. On tying and cutting these it was found that no proper mesentery of the appendix had been divided. Therefore in order to free the mass ligatures were passed below and what was at first considered to be the lumen of the appendix was tied off and divided. This not freeing it, another was passed closer to the bowel, which proved to surround the real appendix. The other lower ligature was then examined again, a probe passed in: it which discovered it to be the divided ureter. The other end was then sought for and found in the connective tissue, demonstrating that the right ureter had become enclosed in the mass of inflammatory tissue with the appendix. The mass was then removed entire, leaving the two ends of the ureter and the stump of the appendix in a field of retroperitoneal connective tissue. The stump of the appendix was first treated. On attempting to invert it into the cecum it was found to be impossible to do so. It was further discovered on enlarging the field of operation that the ileum was below the previous site of the abscess, passing to the right over the top of the cecum, such was drawn to the left up under it and the two united by fresh adhesions. On separating these adhesions and straightening out the ileum, it was found necessary to pass the stump of the appendix through the mesentery of the ileum before it could be inverted into the cecum. This being done the hole in the mesentery of the ileum was sutured. The two ends of the ureter were united by a Robson uretero-ureter anastomosis and the free end of the omentum utilized to cover the raw peritoneal surface and the ureteral junction. A Morriswick drain was placed to the site if the abscess resting on the omentum and the walls of the abdomen closed about it, a second small drain being inserted more superficially.

In reviewing this case we find that the appendix was situated above the ileum and to the inner side of the ascending colon that the stump of the appendix had to be passed beneath the ileum through its mesentery in order to be inverted into the cecum and that the whole mass was retroperitoneal, involving within itself one half to three quarters of an inch of the ureter (this much being found afterward on examination of the abscess mass). The only explanation of these conditions would be a hernia of the appendix into the ileo-appendicular fossa, its subsequent inflammation with abscess formation and the involvement of the ureter within the inflammatory mass.

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THE INDICATIONS FOR ABDOMINAL CÆSAREAN SECTION¹

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IT is not the purpose of this paper to make an exhaustive study of the many indications for abdominal Cæsarean section.

Such a review while it might possibly be made interesting and profitable to the obstetrician, would be out of place before this body of general surgeons and gynecologists, whose work, as a rule and from choice, is not along obstetric lines. Therefore I propose to discuss some of the more important and commoner indications for the operation under consideration illustrating the various indications by cases from my own practice.

First, let me say that it is my belief that the chapter on the indications for abdominal Cæsarean section must be rewritten, on account of the great advances made in the technique of the operation. Undoubtedly the results of abdominal Cæsarean section will be still more satisfactory once the surgeon comes to a full realization of the fact that, unlike the intestine the stomach or the bladder the pregnant uterus, where sepsis from below is present or liable to develop, cannot be incised by the abdominal route without grave danger of a fatal issue from peritonitis. It is difficult to keep this difference in mind. Still it must be done if the indications and contra-indications for the operation are to be intelligently studied.

Obstetrics is perhaps one of the most, if not the most, conservative department of medicine and surgery. The obstetrician, among other things, gives up a great deal of time to the consideration of how the fetus or passenger shall best be conducted through the pelvis or the passage. Sometimes the latter is narrow or otherwise obstructed. Sometimes the fetus in itself or in its position is at fault, and complicates the problem. At other times the difficulty lies with the power or uterine contractions. The obstetrician's art consists in unraveling the tangle and so changing conditions as to make it possible for a live child to be born by the natural

passages. And giving up so much time and thought to the problem, he very naturally is somewhat contemptuous of the surgeon who waving aside the problem outlined above, settles the question by removing the child through the abdomen. Now I must confess that my sympathies are chiefly with the obstetrician. I am afraid that I am not any more in accord with the surgeon who does an abdominal Cæsarean section on the slightest provocation than I am with the operator who does not attempt to make a diagnosis of an abdominal growth, on the plea that such a procedure is useless, since he will find out what is the matter after the abdomen is opened. Neither operator is playing the intellectual game fairly each is seeking the path of least resistance.

However while my sympathies may be with the obstetrician, I cannot but think he has been at times ultraconservative, and that the results for both mother and child being obtained by the advocate of the abdominal route should lead him to revise his opinions, and see if at times prejudice has not prevented his adoption of certain procedures. To put it another way the only right the obstetrician has to demand that the child be born through the natural passages is through his ability to show that by so doing a better mortality and morbidity for mother and child will result. When, through ultraconservatism or a desire to maintain a position at all hazards, the obstetrician's statistics in any class of cases compare unfavorably with those advocating more radical methods, the accoucheur is fighting a losing game. And the sooner he realizes this, the better will it be for his patients and for himself. Perhaps an illustration will help to make my meaning clear. For generations past, medical students have been taught when and how to apply high forceps. Teachers and pupils have become expert operators, and in many instances have saved the children with no injury to the mothers.

However if it were to be shown that, in a given series of cases with heads at the superior strait, better maternal and foetal results follow abdominal Caesarean section there should be nothing to hold the obstetrician to the subpubic route. Just because in the old days the results with high forceps were superior to intraabdominal methods, it does not naturally follow that the same holds true to-day. All of which goes to prove that obstetricians, as well as other people while holding fast to old and tried methods, must be open to conviction and be broad enough to accept the new if that be shown superior.

The classification of Routh seems most suitable for a consideration of the indications for abdominal Caesarean section. I shall take the liberty of only including the more common indications, conditions one is liable to meet with in the ordinary course of hospital or private obstetric practice.

1. Obstructions to labor (a) Pelvic contractions, (b) fibromyomata, (c) ovarian tumors, (d) stenosis of cervix and vagina (e) miscellaneous (previous ventrofixations large size of child)

2. Uterine hemorrhages (a) Concealed accidental hemorrhage, (b) placenta previa.

3. Constitutional crises eclampsia.

1. OBSTRUCTIONS TO LABOR

(a) *Contracted pelvis* Probably more Caesarean sections will be performed for this indication than for any other. A few years ago a comparatively rare operation and performed only as a last resort, under unfavorable conditions and with correspondingly bad results, abdominal Caesarean section has now become an elective operation. It is now undertaken with full confidence that in clean cases the most satisfactory results will follow.

The operation is imperatively demanded in cases where the conjugate vera measures 7.5 cm. or less, and the child is living. When the child is dead and the true conjugate is 6.5 cm. or under Caesarean section is still indicated on account of the danger to the mother of attempts to deliver the craniotomized child through such a small pelvic diameter.

It must be borne in mind that there is much uncertainty as regards pelvic measurements.

Until the patient with a medium contraction of the pelvis say with a conjugate vera of from 8 to 9.5 cm. has had a test of labor it is impossible to say whether she will be able to have a child through the natural passages or not. Therefore a primipara with a pelvis within these measurements should be given a test of labor. If after a suitable trial the head is still above the superior strait, with no progress, Caesarean section is indicated or the advisability of pubiotomy should be considered.

The following case will serve as an illustration.

CASE 1. Miss L. M., aged 20 primipara. Pelvic measurements were intersphincts 20, Intercristal 21.5, biischial 9, true conjugate 8. Diagnosis, generally contracted pelvis. Patient was in labor for 24 hours, with no engagement of the head. Abdominal Caesarean section, January 20 1909. Mother made a good recovery. Child lived 24 hours and died from enlarged thymus.

Looked at from another standpoint, the criticism might be made that the case was treated too conservatively and that the conclusion could have been reached even before labor—that a natural birth with such measurements was impossible. But just here enters the element of doubt because the patient was a primipara, and an unknown quantity so far as her ability to drive a child of a certain size through this particular pelvis. As long as the patient was not subjected to repeated vaginal examinations and attempts at delivery from below if the membranes were unruptured and she were not exhausted by long continued labor pains, her chances with an abdominal Caesarean section were not diminished.

On the other hand had the case been neglected, had the patient been repeatedly examined and many attempts made to deliver from below abdominal Caesarean section would have been strictly contra indicated. Under these circumstances it would have been far better obstetrics in my opinion to perform a craniotomy. For a Caesarean section under such circumstances would have meant almost sure sepsis and probable death of the mother with very slight hope of saving the child already jeopardized by attempts at delivery from below.

The case is different with multiparae who have had a number of tests of labor and have lost their children from forceps or attempts at version or from other obstetric operations from below. Under these circumstances it is wise to raise the limit of the extent of pelvic contraction where an elective Cesarean section is advisable.

The following is a case in point.

CASE 2: Mrs. L. M., aged 35, IX-para. First child born at seventh month, next two children at full term, and lived. Instruments used on last five children, all of whom died. Pelvimetry: Interspous 30, Intercristal 24, external conjugate 8, true conjugate 9. Diagnosis, generally contracted flat pelvis. Abdominal Cesarean section March 7, 1907 at the onset of labor pains. Mother and child made good recoveries.

This patient was so well pleased with the results of the operation that she re-entered the hospital thirteen months later for another Cesarean section which was performed for the same conditions. Again mother and child made good recoveries. At this time, however, at the request of the patient and her husband, the tubes were cut and buried beneath the peritoneum in order to sterilize the patient.

(b) *Uterine fibromyomata as indications for abdominal Cesarean section.* Luckily women with uterine fibroids either do not conceive or else they abort within the first three months of gestation. The reason for the early termination of the pregnancy is very apparent if one studies the ovum where the pregnancy was accidentally discovered after hysterectomy or where the uterus was removed without reference to the pregnancy. During the past five years I have been able to turn over four specimens of uterine fibromyomata complicated by early gestations of from two to three and a half months to my colleague Dr. G. Carl Huber, professor of embryology. It is very important to the success of Dr. Huber's embryological studies that there be no pathological changes in the material examined. For this reason, embryos obtained from abortion cases are rather unsatisfactory for necessarily abortion is a departure from the normal. Hence it was hoped that in these four cases mentioned perfectly normal embryos could be studied in situ, yet in each

instance the embryo was imperfect, from degenerative changes due to hemorrhages about the ovum.

If the embryo escape these changes and pregnancy continue the treatment will depend upon the situation of the fibroid growth in the uterus and its relation to the pelvis. Also it must be borne in mind that a fibromyomatous uterus may be a handicapped organ, and that its contractile powers may be interfered with to such an extent as to permit of serious and at times fatal post partum hemorrhage. Rarely is the uterus the seat of a single tumor hence myomectomy after the removal of the fetus by abdominal Cesarean section will be rarely called for. Fibroid tumors obstructing labor will almost always be cervical or intraligamentous growths. Other varieties will be lifted up out of the pelvis by the developing pregnant uterus, and will not as a rule obstruct labor. From the standpoint of safety to the mother it would seem best to do a Porro rather than the classical operation where the pregnancy or labor is complicated by uterine fibroids. However in the case of a first pregnancy the mother should have the right to decide in favor of the retention of the uterus, so that future pregnancies will be possible.

The following is an example of a Porro Cesarean section performed at full term for fibroid complicating pregnancy.

CASE 3: Mrs. A. F. multipara, aged 41. Normal pelvis. The last three confinements were terminated by forceps extractions. The patient nearly died from post-partum hemorrhage presumably caused by large fibroid growth in the right uterine wall. Porro Cesarean section August 6, 1909. Mother and child made good recoveries.

(c) *Ovarian tumor complicating pregnancy as an indication for Cesarean section.* Ovariectomy during pregnancy is a perfectly safe and reliable operation, giving a mortality of 3.3 per cent, with labor induced in only about 1 per cent of the cases. With normal pelvic measurements and no reasons for thinking the patient will not have a normal confinement Cesarean section is not indicated, even if the ovarian growth be removed during labor. The indications for Cesarean section would be a cyst so situated that it

could not be removed without first reducing the size of the uterus. Every experienced abdominal operator can easily recall ovarian growths, situated within the folds of the broad ligament, where eradication would have been exceedingly difficult, or even impossible in the presence of a full term pregnant uterus.

Another indication for Cæsarean section set forth by Routh seems to me of value namely unusual rigidity or undilatability of the soft parts as might occur in elderly primipare. In such patients a long tedious labor might place too great a strain upon the recent abdominal wound, with perhaps serious results.

(d) *Stenosis of the cervix or vagina.* By stenosis of the cervix in this connection is not meant a rigid cervix which fails to yield to labor pains, but a cervix which is the seat of extensive scar tissue, usually dating from a previous confinement. This cicatricial cervical tissue is usually associated with extensive scar tissue in the vagina, so that the passage of the foetus through the narrowed lower part of the birth canal would either be impossible or fraught with grave danger. Attempts at artificial dilatation of such scar tissue is also dangerous because of the difficulty of limiting the direction and extent of the stretching, making Cæsarean section a much less dangerous procedure.

Attempts at delivery of a large child through a contracted outlet not infrequently result in extensive tears of cervix and vagina, vesicovaginal fistula, and complete rupture of the perineum. Repair of these injuries often requires extensive plastic operations where tissue must be borrowed from one part to repair another. While usually the defects can be remedied the repaired vaginal canal is usually a mass of scar tissue. A second labor even under skillful handling will mean a second series of tears, ruptures, and fistulae. Under such conditions an abdominal Cæsarean section is indicated and should be performed at full term as an elective operation.

The following is a case of this kind

CASE 4. Mrs T. D. aged 39 entered the University Hospital September 9, 1907. She had had three children only the first of whom lived, the others having been stillborn. Last two labors were

each over thirty hours in duration, and one child weighed fifteen pounds. Since the birth of the last child, three months ago the patient has been unable to control her urine or faeces. Plastic operations upon bladder and rectum closed the vesicovaginal fistula and repaired complete rupture of perineum. So much scar tissue was left in the vagina that the patient was advised in case of subsequent pregnancy to enter the hospital for an elective Cæsarean section.

(e) *Miscellaneous indications.* 1. *Previous ventro- and vaginofixations of the uterus.* As has been shown from cases studied from the Johns Hopkins Clinic, the majority of patients subject to ventrosuspension of the uterus will pass through subsequent labors without mishap. But the number of cases presenting serious dystocia is so large as to render the operation unjustifiable in the child bearing woman when often less dangerous operations will answer just as well. The same will apply with even more force to vaginal fixations which have been especially disastrous where the women subsequently became pregnant.

Whenever in a woman pregnant after a ventrofixation the cervix is carried backward and upward near the promontory of the sacrum, and the uterus enlarges by distending and thinning the posterior uterine wall, an abdominal Cæsarean section is a much safer operation than attempts at delivery from below.

Before I recognized the danger of ventrosuspension in subsequent pregnancies I was obliged to perform two Cæsarean sections on women who were previously operated upon in the University Clinic. The two mothers and children made uneventful recoveries.

2. *Large size of child.* The attempts to ascertain accurately the size of the child in utero have not been particularly successful. Careful palpation of the foetal parts, together with Müller's method of ascertaining the size of the foetal head relative to the inlet and experience in many cases will throw some light upon the absolute or relative size of the child. Where the diagnosis of a very large child has been made and this is borne out by the failure of the head to engage after many hours of labor Cæsarean section is indicated even if the maternal pelvis be normal. This is illustrated by the following case

CASE 5. Mrs. C. W. age 25. Patient had had one dead child at term the labor lasting three days and terminated by forceps. Pelvic measurements normal. The patient was allowed to labor over forty-eight hours since there were no signs of maternal exhaustion. At the end of this time since the head was freely movable above the brim, the cervix was dilated and an internal version performed. The buttocks of the child could not be delivered through the pelvic inlet. Abdominal Caesarean section was immediately performed and an 11 pound child delivered. Mother and child made good recoveries, although the former had a slight sepsis, presumably caused by the manipulations from below.

3 UTERINE HÆMORRHAGES

(a) *Concealed accidental hæmorrhage*. In this grave obstetrical accident the child is usually dead and any treatment will be directed toward saving the life of the mother. Caesarean section is indicated where the hæmorrhage is severe the mother's condition alarming and growing worse and the cervix so rigid as to require considerable time to secure dilatation enough to empty the uterus from below. Under such conditions probably better results will be obtained from abdominal than from vaginal Caesarean section, unless the operator has had considerable experience with the vaginal route. As in operations for ruptured ectopic pregnancy where the patient is in collapse and the hæmorrhage progressing, the paramount necessity is to stop the bleeding quickly and this is best accomplished by the abdominal route. In concealed accidental hæmorrhage, fortunately rather a rare condition the indication is to stop the bleeding and stop it quickly if the patient's life is to be saved. But whether the abdominal or vaginal route be chosen, the uterus after being emptied should be removed. For experience has shown that in the kind of hæmorrhage under discussion the uterus does not contract as it is accustomed to when emptied, but is more apt to remain in a state of atony which means death from post-partum hæmorrhage. Hysterectomy is also demanded to guard against sepsis, which is very liable to develop after severe hæmorrhage from the pregnant uterus.

(b) *Placenta prævia*. Abdominal Caesarean section is only exceptionally indicated in placenta prævia. In the majority of cases the

cervix is soft enough to yield to dilatation, so that various intrauterine manipulations can be employed with a view to stopping the hæmorrhage. In rare cases, as in old primipara, the cervix may be rigid and undilatable. That is, enough dilatation for effective intrauterine work could only be secured at the expense of time which would increase the danger for the mother and probably prove fatal to the child. Under such conditions, if the mother has not been infected by manipulations from below Caesarean section is indicated. The uterus should be removed as the final step in the operation, for the reasons stated when discussing the treatment of concealed hæmorrhage namely the increased danger from sepsis in the presence of severe hæmorrhage.

3 CONSTITUTIONAL CRISES

(a) *Eclampsia*. For those who do not believe in the immediate emptying of the uterus as soon as the patient has been seized with eclamptic convulsions, neither abdominal nor vaginal Caesarean section are ever indicated. However, the majority of obstetricians believe that in the presence of eclampsia the uterus should be emptied quickly and with the least possible trauma. If the cervix is easily dilatable, neither vaginal nor abdominal Caesarean section will be indicated. In the presence of a rigid cervix, however either one or the other route is indicated, rather than the wasting of valuable time over slow cervical dilatation. In the majority of instances vaginal Caesarean section is the preferable operation, since it is performed from below without entering the peritoneal cavity. Where the pelvis is contracted, abdominal Caesarean section is indicated provided the patient has not been infected from below by repeated examinations or unsuccessful attempts at delivery. Under such conditions craniotomy on the living or dead child is the preferable operation.

I am at the present time engaged in tabulating the results of 425 cases of eclampsia treated by abdominal Caesarean section, and some very interesting facts are being brought out. Not only has the literature been carefully searched and all recorded cases been

collected, but many operators all over the world have been kind enough to furnish me with unpublished cases. Thus the statistics represent not the work of a few but over two hundred operators.

The total maternal mortality counting patients operated upon before the aseptic era, was 36.9 per cent, while this was reduced to 31.8 per cent if only the 317 patients operated upon since 1900 are counted. The fifty per cent mortality ascribed to abdominal Cesarean section in the treatment of eclampsia can be explained by errors in the selection of cases, for many eclamptic patients were subjected to the operation who were hopelessly septic. These patients did not die from the eclampsia or the operation itself. Many of them perished because of poor judgment on the part of the operators. They would have died even if the operations had not been performed for eclampsia.

In 245 cases of eclampsia where there was no sepsis or very little chance of sepsis prior to the abdominal Cesarean section, the maternal mortality was only 24 per cent. It is significant that in 50 cases where operative

procedures preceded the Cesarean sections, the maternal mortality was 48 per cent, the difference in mortality being due not to the eclampsia, but to the sepsis accompanying the eclampsia, a condition which can be avoided once this relation of sepsis to Cesarean section is fully realized by the profession.

The results of abdominal Cesarean section for eclampsia so far as the foetus is concerned should be and as a matter of fact are, gratifying in the 425 cases. In 317 cases since 1900, where the foetal statistics could be studied the foetal mortality was only 5.5 per cent. Even this mortality is reduced to 3.7 per cent in 132 cases where the sections were performed after from one to five eclamptic convulsions.

These statistics are quoted to show that the last word has not been said regarding the place of abdominal Cesarean section in eclampsia. At least, the statistics in over 400 cases have shown beyond a doubt that no one is justified in dismissing the treatment of eclampsia by abdominal Cesarean section with a short statement that the mortality is so high as to make it an unjustifiable operation.

TRANSPLANTATION OF TUMORS IN ANIMALS WITH SPONTANEOUSLY DEVELOPED TUMORS

BY MOYER S. FLEISHER, M. D. AND LEO LOEB, M. D. BAYNET LODGE

From the Department of Pathology of the Second (Frem) Skin and Cancer Hospital

THE large majority of all experiments in transplantation of tumors were carried out on normal animals. It was apparently tacitly assumed that the conditions existing in normal animals or in animals with an inoculated tumor on the one hand and in animals with a spontaneous tumor on the other hand were identical. The first experiments in which tumors were transplanted into animals with spontaneous tumors one of us reported about 21 years ago. Loeb (1) found at that time that pieces of an adenoma of the mammary gland of a white rat could be transplanted very much more easily into a rat in which the tumor originated

than in other rats. Later Loeb and Leopold (2) found a similar condition to prevail in the case of a mixed tumor of the breast of a dog in which pieces of tumor could be easily inoculated in the animal in which the tumor originated, while the tumor could not be transplanted into other animals. It was especially noteworthy that in both these series of transplantations the transplanted pieces remained alive *in toto* in the animal in which the tumor had originated spontaneously while in other individuals the whole transplanted piece, or at least its center became necrotic, and as is well known after transplantation of the ordinary tumors transplantable into other

Individuals the center becomes necrotic while the periphery remains alive in cases of successful transplantation. Loeb (3) also reported later a few observations in mice which seemed to point to the conclusion that mice in which a tumor had originated spontaneously were more liable to form a good soil for the growth of spontaneous tumors of other mice than normal mice without spontaneous tumors. He had however made only very few observations concerning this point and his conclusion in this respect was only a tentative one.

A number of investigators confirmed our observation that tumors grew after transplantation in animals in which they had originated very much better than in normal control animals. Haaland (4) while confirming our conclusion that animals with spontaneous tumors form a better soil for the growth of their own tumors than normal mice, maintained that tumors which originated in other individuals of the same species could be transplanted just as well into normal mice as into other mice with spontaneous tumors. Within the last three years we resumed our former investigations on a larger scale with the intention of making a more detailed analysis of the difference or similarity in the growth of tumors in normal mice on the one hand and in mice with spontaneous tumors on the other hand. We will give here a brief summary of our results.

Fifteen mice were inoculated each with one piece weighing approximately 70 milligrams, of their own tumor. In 14 of 15 mice (93%) the inoculated pieces grew. Two of the tumors used for inoculation of mice with spontaneous tumors were inoculated into 68 normal mice as a control experiment and growth was obtained only in two mice (3%). This confirms therefore our former result namely that the individuals in which the tumor originated formed a very much better soil for the life and growth of inoculated pieces than other normal mice.

We now inoculated another series of mice with spontaneous tumors with pieces of spontaneous tumors which had originated in other mice. For these experiments we used 55 mice bearing spontaneous tumors.

Of these 55 mice 16 were inoculated successfully while in the 39 remaining mice the inoculated piece taken from another individual did not grow. We obtained, therefore, positive results in 29%. Sixty nine normal mice were inoculated with the same pieces of spontaneous tumors. Among these 69 normal mice tumors developed only in 5 mice. Positive results were therefore obtained only in 7%. For the inoculation 10 different spontaneous tumors were used. Five of these could be transplanted into other mice with spontaneous tumors. Only two of these 5 tumors which were transplantable into mice with other spontaneous tumors could be transplanted into normal mice and here they grew in a smaller percentage of cases than in the mice with spontaneous tumors. No tumor that could not be easily transplanted into mice with spontaneous tumors grew in any normal mice. In these experiments especial care was taken that the different strains of white mice used in the case of mice with spontaneous tumors and in normal mice were the same so that the results cannot be attributed to the difference in susceptibility to tumor inoculation which exists in various strains of mice. We believe that our results are sufficiently definite to permit the conclusion that in mice with spontaneous tumors there is a factor present which permits tumors in general to grow better than in mice in which no spontaneous tumors had developed.

There is therefore intimately connected with the development of a spontaneous tumor in an animal a condition which favors tumor growth in general. There is, however another conclusion to be drawn from our results. Inasmuch as the percentage of cases in which tumors grew in the same individuals in which they originated is considerably greater than the percentage of growth in other individuals with spontaneous tumors, we must assume that the great facility with which tumors grow in the individual in which they developed spontaneously is due to two factors. First, the factor which we mentioned namely the presence of a condition favoring tumor growth in general in animals affected with a spontaneous tumor and secondly condition

not specific for tumors but applying to other tissues as well, a condition which favors the growth of certain animal tissues in the individual in which the tissue originated as compared with the growth of the same tissues in other individuals of the same species. This latter fact is evidently due to a chemical adaptation existing between the physical chemical character of the body fluids and the composition of the tissue.

Another experiment in which in one mouse the own tumor grew while the spontaneous tumor of another mouse did not grow also proves that the own tumor which developed spontaneously in a mouse has after transplantation an advantage over a tumor developed spontaneously in another mouse. In a similar experiment, however both the spontaneously developed tumor of the same animal and a spontaneous tumor of another animal grew in the same mouse.

Bashford has shown that if we inoculate a very large quantity of tumor the number of takes is not so great as in cases in which only the average quantity of tumor is transplanted. After we had confirmed the observation of Bashford in the case of the ordinary transplanted tumors we made a similar experiment in mice with spontaneous tumors. If we inoculated in those mice five times the usual quantity used for an ordinary inoculation we still obtained very good results, inasmuch as in 6 mice out of 8 used the tumors grew. The number of mice used in this experiment is as yet too small to permit of any conclusion as to a possible decrease in the number of takes in mice in which a very large quantity of their own tumor is used for inoculation. If however a decrease exists it does not seem to be considerable.

We know that the large majority of spontaneous tumors in mice cannot usually be transplanted into other normal mice. They grow only in a very small percentage of cases. These tumors are evidently very sensitive to the absence of those factors which constitute the specific adaptation which exists between the tissue and the body juices in each individual. In mice in which tumors developed spontaneously there is present a factor which compensates for and therefore overcomes to a

certain extent, the unfavorable conditions produced through the absence of the specific adaptation between the tissue and the body juices in other individuals of the same species. There can be found however as we know certain tumors which are evidently very much less sensitive to the absence of this specific adaptation between tissues and body juices of an individual and which grow very well in a very much larger number of individuals of the same species sometimes in almost all the animals of a certain strain. It was of interest to investigate how the easily transplantable tumor grew in mice with spontaneous tumors. Here I shall give merely a brief summary of some of our results. We used for these experiments a tumor number 9 found in our laboratory which we had transplanted through many generations of mice. Number 9 grew in mice with spontaneous tumors approximately in the same number of cases as in normal mice, perhaps slightly less. If we decrease the percentage of takes of number 9 by exposing it to a temperature of 44 during various periods of time we find that these heated pieces also grow somewhat less in tumor mice with spontaneous tumors than in normal mice. If on the other hand we compare the growth of the heated tumor in mice with spontaneously developed tumors and in normal mice which had previously been successfully inoculated with a non heated piece of number 9 we find that the heated pieces of number 9 grow decidedly better in mice with spontaneous tumors than in mice in which previously inoculated tumor number 9 is growing. We believe this observation is to be interpreted as indicating that the spontaneously developed tumors do not call forth immune mechanisms to the same extent as a rapidly growing number 9 tumor. Even if we inoculate a mouse with a spontaneously developed tumor first with its own tumor and 14 to 15 days later with number 9 number 9 grows very well notwithstanding the growth of the spontaneously developed tumor and a second tumor developing from the piece excised from the spontaneous tumor and retransplanted into the same animal.

The factors which, in normal mice, cause a retrogression of a certain number of tumors

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SIGMOID ADHESION¹

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VERY interesting and important problem is the elucidation of left-sided pain in women. So much is being said and done about pain in the right abdomen of both males and females that our attention for the time is directed away from other regions. Kinks and membranes are the order of the day. Thus far those which are named are found upon the right, but not to be ignored are similar conditions occurring at the other end of the large intestine. Adhesion of the sigmoid is associated with definite symptoms, which I believe may be relieved by simple means.

Three years ago in a paper read before this association I ventured to point out the existence of adhesions of the sigmoid to tube and broad ligament as giving rise to much of the suffering in cases of salpingitis. Further observation and experience have served only to strengthen the opinions then expressed. Indeed, the whole question has assumed a broader aspect, and it enters into the consideration of every pelvic case in our work whenever left-sided pain is a prominent symptom. This is a common complaint of women, but it is not always properly interpreted. Too often the ovary is regarded as the chief offender and is needlessly sacrificed. It is not too much to say that the ovaries themselves are rarely the actual seat of pain. More often tubal disease is the source of pelvic suffering and usually precedes ovarian involvement. In numerous instances neither tube nor ovary is affected and some other explanation of the pain is demanded.

The particular thing which is characteristic of the sigmoid adhesion is pain during defecation—not so much before or after but during the act. Patients will sometimes describe a temporary stoppage at a certain point. Constipation is the rule but a small proportion of the cases have shown loose bowels with mucous discharges alternating

with the constipation. This condition is seen largely in old women past the climacteric, in some of whom the uterus is plastered back against the rectum. There is also a dragging sensation which comes and goes, and even a constant aching. Usually the pain is low down, below the anterior spine of the ilium at times it may be high, as far up as the splenic flexure.

Physical examination brings out very little evidence. Tenderness is never marked and does not exist at all in the majority of patients. The diagnosis must rest upon the subjective symptoms. The presence of the adhesion is to be suspected in any case of left-sided pain. Excluding pelvic disease is a great help though not essential for the sigmoid adhesion may occur on account of lesions in the pelvis or independent of them. In either event the indications are the same. If however affections of the ovary and of the tube can be eliminated the bowel adhesion may be more positively predicted.

With the ordinary conditions in which the sigmoid is involved in widespread pelvic inflammation, just a dense conglomerate mass, we have no concern for such adhesion is but an incident and is overshadowed by the pelvic disease. The form of adhesion generally seen as the cause of the symptoms just detailed is that in which the sigmoid is carried far down on the broad ligament, placed against the lateral wall of the pelvis or even pushed up over the Fallopian tube. Of course, the position of the sigmoid flexure may normally show wide variations. It may be attached at different levels. It may be tense or slack. For the purpose of our present consideration it becomes pathological only when it is adherent in an abnormal position fixed and permanent, and gives rise to symptoms.

In respect to the origin of the sigmoid adhesion we are very much at sea. Undoubtedly in some instances it has resulted

¹South M. J. N. No.



Fig. 1. The sigmoid adhesion as typically seen involving the fallopian tube.



Fig. 2. The sigmoid is raised on the forceps, showing depth and extent of adhesion.

from previous mild cases of pelvic infection in which the ovary may or may not have escaped. As a rule we have observed that the more severe the symptoms, the more the tube was involved. But there are not a few which show no sign of adnexal disease and these must have something to do with the factors that are supposed to work in other parts of the abdomen viz., intestinal stasis and faulty posture. It seems evident that putrefaction inside the intestinal tube has much to do with all these specific adhesions, either as cause or effect or both. The vicious circle idea could not be better illustrated.

There is a clear-cut symptomatology associated with adhesion of the sigmoid. In addition to the 9 cases referred to in my former paper there have appeared 15 more in which the sigmoid adhesion has been the sole lesion found to explain the symptoms. For the most part the diagnosis was made, tentatively or positively before operation and found correct in some instances the condition was not found when it was suspected while in others it was discovered

when not suspected. At any rate one should be able to pick out the condition in the majority of cases. Typical examples are these. A young married woman who had given birth to three children complained incessantly of pain in her left side and was sent in as a case of tubal disease. Her greatest suffering was on going to stool and she was obstinately constipated. Pelvic examination was negative. Her abdomen was opened and a classic sigmoid adhesion revealed. This was dealt with and the abdomen closed. After the operation even while lying in bed, she never required a purgative and has been entirely free from pain now more than two years. This is an operation which can be safely and successfully done for constipation.

Another instance was that of Mrs. W. aged 32 who several years before had had a still-born child and who had been twice operated on without relief for supposed pelvic infection. Left sided pain and real obstipation were the features of her story, while scanty and painful menstruation added to her

discomfort. She presented the appearance and signs of chronic intestinal stasis. Three years ago an old dense adhesion of the sigmoid flexure to the tube was released with difficulty and after a rather prolonged convalescence the patient was restored to health, both in feeling and in looks. At the present time she has no pain and is but rarely constipated. On the eighth day after operation the cul-de-sac had to be punctured to let out a collection of blood which had oozed slowly down from the insecurely approximated raw surface. This is likely to happen particularly in cases of long standing unless great care be exercised.

The method of dealing with the adhesion may be quoted from my former paper.

After snipping the bands which fix the sigmoid to the broad ligament, there are left two triangular raw surfaces, one on the bowel and the other on the ligament, with their bases together; these form a diamond-shaped area. The peritoneal edges are then closed over this space by continuous catgut applied from below upward. The sigmoid is thus allowed to drop lower down into the pelvis, away from the tube and ligament—a maneuver which in my opinion, must be executed to secure permanent relief. Covering all denuded places is not less important. The only modification of this technique which we now advise is the use of an interrupted catgut suture instead of a continuous one.

Incision at the outer border of the left rectus gives easier access to the parts. It will be more often necessary however to operate through the median line on account of the occasional association of other lesions in the pelvis. In either event the incision should be long longer than is usual for ordinary abdominal work, in order that the manipulations may be readily carried on.

The real problem before us is to determine what makes the adhesion at this particular spot. It must be borne in mind that the large bowel is apt to kink at certain places where the turns are sharp and they are more liable to occur at the fixed points. The cæco-ileac region has received its share of attention and the hepatic bend has given us the famous expression of "cobwebs in the

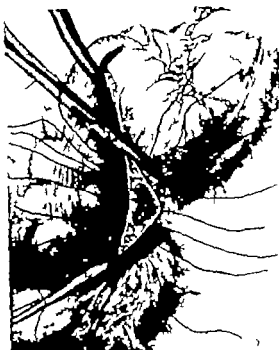


Fig. 3. The adhesion has been divided crosswise between forceps and is being sewed up longitudinally with interrupted catgut sutures. This shows the sigmoid t. drop away from the tube and underneath the broad ligament.

atroc. The splenic flexure is of more importance than has appeared from the little consideration given it. I think I have shown that the sigmoid adhesion is a distinct surgical entity and that it is amenable to proper treatment. Now the same agencies must be at work in all these conditions. Is the large bowel only at fault? All the physiologists and internists have told us that the condition known as "intestinal indigestion" is due to fermentation and insufficient digestive action in the small bowel. It is intimated even Lane has begun to inquire whether the whole affair does not originate in decomposition of material in the small intestine.

Sigmoid adhesion may occur first, from a combination of congenital predisposition, improper support and intestinal putrefaction or second it may result from inflammatory conditions in the pelvis. In many cases both sets of causes obtain. No affection of its kind within the abdomen shows more definite signs or gives fairer promise of cure.

ACUTE INVAGINATION OF THE ILEUM SECONDARY TO SARCOMA OF THE SMALL INTESTINE

REPORT OF A CASE

H. C. JEFF MILLER, M. D., AND W. ORLEA

TUMORS of all types benign and malignant are rarely observed as primary growths in the small intestine. Malignant growths are the most frequent and of these sarcoma constitutes the predominant type.

Movshian collected 40 cases in 1906 and Lecène in 1907 found records in the literature of 89 cases. These two tabulations seem to be the most complete yet published. From the time of the appearance of Lecène's article up to date 26 other cases were reported making a total of 115. A study of this material is exceedingly interesting, from both the pathological and clinical standpoint.

In 46 of Lecène's cases the anatomopathological reports were complete and furnished the comparative incidence of the location of the growth. It was situated at the duodeno-jejunal junction in 3 cases in the jejunum in 11 the ileum in 16 and in 6 at the ileocecal junction.

Practically all authorities with the exception of Libman, state that it rarely ever develops in the duodenum. Libman found among 42 cases the duodenum affected as often as the ileum. Perry and Shaw found only 9 cases of duodenal sarcoma recorded in Guy's Hospital Report in 63 years.

The following case is of interest because of some diagnostic features, the probable development of the growth upon cicatricial tissue following a previous attack of typhoid fever and the occurrence of intussusception a complication noted in several of the reported cases in which the growth was small.

Case. It nourished young man, 25 years of age, as seized while working in severe pain in the right lower quadrant of the abdomen. A short time after all of the symptoms characteristic of acute appendicitis developed. His family physician made tentative diagnosis and had resorted to the application of ice bags, restricted diet and gave an enema that caused copious bowel evacuation. He was very

much relieved for 6 hours, then all the pains returned and his temperature rose to 100.2. He was suffering intensely when I saw him at midnight of the same day. The abdominal muscles are rigid, there is beginning distention and distinct mass could be outlined in the ileocecal region.

He was removed at once to the hospital and his abdomen opened. A quantity of amber-colored fluid flowed from the incision. When the carcass was exposed it was found to be thickened, congested, and somewhat fixed and contained mass which was first thought to be fecal collection. The appendix was unusually long, oedematous and dilated at the end. After some difficulty the carcass was delivered through the wound and the condition was found to be an invagination of a portion of the ileum through the ileocecal valve.

The telescoped portion was easily reduced and measured about 15 inches. Inspection revealed a contracted area completely surrounding the intestine 3 inches from the ileocecal valve which was evidently of long duration. The peritoneum over the area of tumor seemed shriveled and fused with the muscular layer, and it was impossible to pass the tip of the little finger through the lumen of the bowel. Resection as performed and the tumor restored by a lateral anastomosis.

The abdomen was closed after drainage had been provided for through stab wound incision below the pubes.

His convalescence for days was uneventful. He then complained of a pain in the wound, which finally opened at the lower end and discharged bloody serum and was followed by rise of temperature for 4 or 5 days. On the sixth day after the operation he was taken violently ill, rapidly developed symptoms of severe shock and passed large quantity of blood by the bowel. He was promptly removed to the operating room where he died while preparations were being made to re-open the abdomen.

The incision was re-opened and the hemorrhage found to have occurred from a sloop in the mucus membrane of the carcass near the valve probably due to a thrombus. The site of the anastomosis appeared normal.

The gross specimen presented the typical appearance of cicatricial tissue. The lumen was contracted until it would admit nothing larger than an ordinary lead pencil. The

mesentery was also contracted for about 2 cm. distance from the intestine.

While the specimen was being examined his physician stated that he had treated the patient during a severe attack of typhoid fever which was attended with intestinal hemorrhages several years previous to the present illness and suggested that the lesion was probably due to contraction following ulceration of Peyer's patches. When the specimen was laid open and the interior exposed, there was found a buttonlike mass somewhat larger than a twenty five cent piece situated in the center of the cicatricial area. The growth is well shown in the accompanying illustration, with the exception that it was not so thick as it appears in the drawing.

The following report upon the specimen was submitted by Dr W. H. Harris pathologist to the Presbyterian Hospital

Mr M. February 1912 Pathological Description. Gross—segment from small intestine 10 cms. in length. It presents on its external surface just to one side of the mesenteric attachment an umbilicated puckered area completely surrounded by an elevated ridge. This ridge forms a symmetrical circle and measures 2.5×2.5 cm. In the center of the depression is a small mass which has broken through the serosa from within and forms an irregular protrusion on the outer surface. The caliber of the gut is considerably narrowed by this hard refracting mass. The lumen of the gut is so narrowed that only a small swab 5 mm. in caliber could be passed through and even this, as shown upon opening the gut, has torn the surface. Upon laying open the intestine its internal surface presents a distinct buttonlike nodule corresponding in location to the area described on its external surface. It is distinctly round in shape, of a red color and has a smooth, unbroken surface. It measures 2.3×2.3 cm. by 6 mm. in thickness. A section transversely through tumor shows the mass to be well limited by the intestinal coats, except near its center where it projects well towards the outer surface. Its edges adjacent to gut wall are clearly shown and are slightly irregular in their contour.



Microscopic Tumor is found of irregular clusters of small black cells contained in a rather delicate stroma of connective tissue. The cells measure about 8-10 μ . in size and stain a deep blue with eosin-haematoxylin. The nuclei are relatively large and occupy the greater part of the cells. Evidences of mitosis are seen scattered throughout. A vestige of the muscular coat of the intestine is present. It is very irregular in outline and shows degeneration. At one point the continuity of this coat is broken and the tumor cells have extended through and spread over its surface externally.

Germinal centers and other evidences of lymphoid follicles, or Peyer's patches, are not seen.

Diagnosis Sarcoma of the small round cell type or lympho-sarcoma.

A search through the list of reported cases revealed only a few similar instances in which sudden acute symptoms gave the first warning of intestinal trouble. I found only 3 such cases in Moynihan's list. In the other 37 cases, symptoms of transitory abdominal pain occasional vomiting attacks and nausea, preceded the recognition of the growth from a few weeks to over 3 years.

If there could be a cardinal symptom it would be the presence of a tumor. It was present in over 90 per cent of the cases when brought for examination or operation.

It is always present in children and nearly as constant in adults. More than half the cases were reported in patients over 40 years of age. Cachexia is only marked in children, except in the late stages.

Fever was often present, as would be expected from the large percentage in which ulceration occurs.

Constipation is not a reliable symptom though often present. Diarrhea was noted in a few.

Three cases have been reported as occurring in the few years after severe attacks of typhoid fever and Nothnagel reported an instance of sarcoma that developed from tuberculous ulcerative astra.

From the case histories on record one must infer that few were correctly diagnosed prior to operation. Anderson is responsible for the statement that he could find no record of a case in which the diagnosis could be made.

Libman who has made an excellent study of the subject, has suggested the following *clinical classification as of value in diagnosis*:

1. Latent cases in which the tumor is suspected at autopsy
2. cases in which the first symptoms are brought about by intestinal occlusion or perforation
3. those in which a similarity to peritoneal tuberculosis is demonstrable
4. cases in which icterus is the first symptom
5. those in which no tumor can be felt
6. cases in which a pronounced resemblance to appendicitis is present (Van Hook)

I find that no case that developed sudden abdominal symptoms was suspected previous to operation, and that the diagnosis of appendicitis had been made oftener than any other affection.

The cases in which the symptoms developed suddenly were often associated with acute obstruction and in several instances intussusception, such as related in the above history. This has been associated as a rule with quite small growths, in one instance no larger than a cherry.

The location of the growth may be of some diagnostic value. The higher in the intestinal tract the situation of the tumor the more pronounced are the symptoms. So far the X ray has not been used enough to prove its

true value. In a recent case of lipoma of the small intestine with invagination, the mass was demonstrated by X ray. Obstruction of the bowel is a frequent complication, but stenosis of the intestine is rare. Lecène found only 2 cases out of 89 in which stenosis occurred.

On the other hand intestinal dilatation is the rule, an especial though not constant attendant phenomenon of lympho-sarcoma and due according to Lecène to a progressive infiltration and final destruction of the smooth muscle fibers without defensive reaction of the connective tissue in marked contrast to the changes common to carcinoma.

The round-cell type of tumor is recorded in more than 50 per cent of the cases spindle cell and lympho-sarcoma the next most frequent, with scattering reports of 1 or 2 each of fibro, myxo angio, giant-cell and alveo-sarcoma.

In 30 out of 46 instances the growth was single in 16 multiple. It is curious to note the frequency of adhesions between the bladder and the involved coil of intestine. In 46 cases Lecène reported adhesions in 27 of which were instances in which the bladder was the involved structure.

The mesenteric glands are involved early in the course of the disease. It is interesting to note that among the cases in which remote metastases were recorded the kidney was the organ most frequently involved.

The first fact impressed upon one who reads the collected reports is, that the surgeon sees the cases too late. There is already a palpable tumor in over 90 per cent of the cases when an operation is proposed yet if Mayo has a list is carefully studied only 4 or 5 cases failed to present symptoms of abdominal disturbance of some sort, varying in duration from a few weeks to 3 years, all of which goes to illustrate the surgeon's great responsibility in placing upon the surgical aspects of chronic intestinal disturbances. Libman takes an extremely gloomy view of the surgical results, particularly in cases of lympho-sarcoma with metastases, in which even exploration hastens the end. Even with the acknowledgment before us that the diagnosis is seldom made before operation, or until the growth is pal-

pable the results have not been altogether bad. Hahn reports a case free from recurrence for 8 years, Steinthal 1 for 4 years and another for 3½ years. Mickulicz 1 for 2 years, Haggard one over two years, and quite a number are recorded as having passed over a year without recurrence. In the case personally observed it would appear that but for the complication of hæmorrhage the patient had an excellent chance for a permanent recovery.

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SUPRAPUBIC PROSTATECTOMY¹

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I AM led to present this paper at this time less because I have new material to present than because I believe it to be the duty of each one of us who is engaged especially in this work to express from time to time his opinions upon important questions under discussion and to give his reasons for the faith that is in him. Even if no absolutely new facts are presented information of value may be forthcoming because the facts are seen from a somewhat different angle. Furthermore I feel that no apology is due to this association for the discussion of the subject of prostatectomy as to this society in times gone by have been brought the contributions of Belzeld Bryson Watson Alexander and Young.

For the sake of clearness, and because I feel that the problems are of a somewhat different nature I shall confine myself to the discussion of the management of those types of enlargement of the prostate commonly

referred to as hypertrophy. I desire at this time to pay my respects to the phrase hypertrophy of the prostate, as at once inaccurate and misleading. The process referred to by this name is not true hypertrophy. In the first place as has been pointed out by many including Geraghty it is not a process correlated to other processes ordinarily referred to as hypertrophy for it occurs at a time of life when atrophy and not hypertrophy is taking place. Again this so-called hypertrophy involves only certain portions of the gland and if the term is to be used at all it should be clearly stated in what parts of the gland the abnormal tissue originates. Work modern and less modern seems to me to have made it abundantly clear that the process is not hypertrophy but the formation of new tissue of adenomatous character arising in certain portions of the gland and replacing in whole or in part the normal tissue. This distinction is important and not a mere

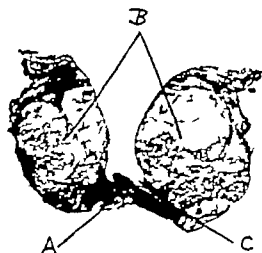


Fig. 1. Sagittal section of adenomatous prostate about level of verumontanum. A, posterior lobe; B, adenomatous masses in lateral lobes; C, line of cleavage (junction of lateral wall and floor of urethra).

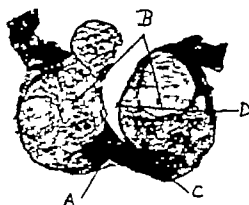


Fig. 2. Section of mass prostate as Fig. 1, about cm. farther back. A, posterior lobe; B, adenomatous masses in lateral lobes; C, line of cleavage (junction of lateral wall and floor of urethra). D, masses encroaching from under both lateral mass B must be eradicated in Young's operation. Not the probability of less big adenomatous masses along the urethra, here attempting to eradicate mass B from below by Young's method.

qualifiable for upon a more or less thorough understanding of the position and origin of these adenomata must depend our belief as to the most successful and efficient methods of attacking them. If we were to proceed upon the theory that this is a true hypertrophy involving all portions of the gland we might readily reach the extraordinary position occupied by Mr. Freyer and Mr. Thompson Walker *viz.*, that by what he is pleased to call his (Freyer's) method the whole gland is removed—a question to which I shall have occasion to refer later. I hope that the weight of opinion of this association will be thrown in the direction of removing this troublesome misnomer from the field of medicine.

Origin of the adenomatous masses. Appreciating the fact that the process is due to newly formed tissue in the form of adenomatous masses it then becomes essential to clearly apprehend from whence these masses arise and also to bear in mind the anatomical division of the gland into lobes which are constant. The excellent study of Lowley has crystallized our knowledge upon this subject so that we are in a position to declare that the division of the prostate into a posterior a median and two lateral lobes is correct

bearing in mind the occasional persistence of an anterior lobe which ordinarily disappears in foetal life and the more or less frequent occurrence of detached groups of glands, such as the subcervical group described by Albarcan. The disagreement of Tandler and Zuckerkandl with this classification is, I think more apparent than real for it seems to me to depend simply upon a definition of the extent of the median lobe which they regard as including what Lowley has shown to be the lateral lobes. The distinction does not seem to me important. Recent work makes it abundantly clear that the adenomatous masses, ordinarily referred to as hypertrophy arise from the median lobe the lateral lobes, and occasionally from the subcervical glands and a persistent anterior lobe. There is no evidence that they ever arise from the posterior lobe, and this should be appreciated if we are to get any clear understanding of the tissues to be traversed in attacking the masses and the amount of those actually removed in any given operation.

Anatomical considerations. Though I regret to have to take this association over ground which is largely or wholly familiar I feel required to point out the different nature of the covering of these adenomatous

masses when they arise from different portions of the gland. Thus, the masses occupying the lateral lobes are covered posteriorly by the posterior lobe and do not here come in contact with the capsule of the prostate. Laterally they lie against the true capsule of the prostate or as Mr Thompson Walker calls it, the sheath. Superiorly they abut upon the median lobe and in the absence of development of this lobe upon the muscular structures of the bladder neck. Medially they are covered only by mucous membrane and by the stretched and atrophied capsule of the prostate from which they cannot be separated by dissection even after removal from the body.

The mass arising from the median lobe is covered posteriorly by the posterior lobe and as its overgrowth takes it backward it comes to a greater or less extent in contact with the muscular structures of the bladder neck and the bladder wall itself. Laterally it abuts upon the lateral lobes. Anteriorly and superiorly it is like the lateral lobes, covered only by the thin atrophied mucous membrane from which it is inseparable.

Relation of the posterior lobe to the urethra. It will be remembered that the posterior lobe is by definition that portion of the prostate which forms its posterior surface and lies wholly behind the ejaculatory ducts. It thus forms the floor of the urethra from the apex of the prostate to the verumontanum and from this point ceases to touch the urethra and runs backward in a narrowing triangle behind the median lobe. The sides of the urethra are throughout formed by the lateral lobes and the floor of the urethra from the veru to the bladder orifice is formed by the median lobe. This accounts for the horse-shoe form of many adenomatous prostates removed from above in which the sides of the horse-shoe are formed by the lateral lobes while the bow is formed by the median lobe. It further accounts for the well recognized fact that in enucleating the prostate by the intra urethral method whether from above or from below the mucous membrane tears on the sides at the junction of the floor and the lateral wall up to the verumontanum at which point it tears transversely following the line of the median lobe. Upon this depend the undoubted fact that

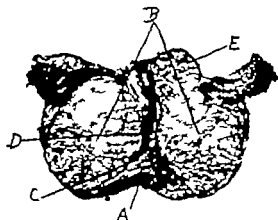


Fig. 1. Section of same prostate as Fig. 1, about cm. further back than Fig. 1. Note the extreme thickness of the covering of the adenomatous mass B at point D. The chance of removing mass B and leaving behind the portion E is obviously great if approached from below by Young's method.

by this method of enucleation the posterior lobe and its structures, particularly the ejaculatory ducts are left undisturbed.

WHAT PORTIONS OF THE PROSTATE ARE REMOVED BY THE METHOD OF ENUCLEATION WHETHER FROM ABOVE OR FROM BELOW?

It seems to me important to take up this question inasmuch as our English brethren particularly Mr Freyer and Mr Thompson Walker still apparently cling to the idea that the whole prostate is removed. This was specifically stated by the latter at the meeting of L Association Internationale d'Urologie in London 1911. A careful investigation of the material upon which he bases this claim singularly fails to establish the fact. It will I think be generally admitted that the removal of the whole prostate must involve the removal of the posterior lobe. If the posterior lobe is removed clearly it must be removed those portions of the ejaculatory ducts which lie between the verumontanum and the capsule. These structures are strikingly absent not only in the specimens described by Mr Thompson Walker but in all the specimens to which I have had access, a not inconsiderable number. The specimens herewith presented show in section that these ducts lie wholly behind the adenomatous masses of the

lateral lobes and the median lobe. As the posterior lobe is never involved in the process the line of cleavage necessarily passes in front of it, and it is from this, the posterior lobe that the process described by Mr. Freyer as the shaking free of the masses takes place. It is probably not necessary to pursue the discussion of this point further since the absence of ejaculatory duct structures from the specimens is sufficiently conclusive proof. What actually occurs in these operations of enucleation is that the adenomatous masses in the lateral and median lobes are shelled out from the capsule of the prostate on the side from the muscular structure of the bladder neck above and from the posterior lobe the old so-called surgical capsule below.

A COMPARISON OF THE TISSUES INVOLVED IN PROSTATECTOMY BY THE SUPRAPUBIC ROUTE AND BY THE PERINEAL APPROACH OF YOUNG

Dr. Young has described his operation as conservative prostatectomy and it is therefore proper to inquire in what respects it is conservative as compared with other methods. I believe that this term conservative was intended to apply chiefly to the conservation of the ejaculatory ducts and to the avoidance of injury to the structures involved in the nervous mechanisms pertaining to potency. In the suprapubic method of approach the masses are reached by breaking through the mucous membrane in the urethra and enucleating the masses from the posterior lobe and that portion of the urethra lying in front of the verumontanum which is left intact. The median portion is separated from the grasp of the muscles of the bladder neck which lie in a relation to it varying with the amount and direction of the growth. The posterior lobe structures are not disturbed and frequently not even uncovered. In Young's operation these masses are approached from behind through oblique incisions intended to avoid injury to the ejaculatory ducts. The incisions traverse the whole thickness of the posterior lobe which has been referred to under the misleading term of the surgical capsule and this is of necessity a destructive procedure. Furthermore the position of the

ejaculatory ducts is not as constant as has been often believed for their position is influenced by the irregularities of growth of the lateral masses and they may lie close together on the posterior surface of the gland or be considerably separated, especially as they approach the upper border of the gland. For most of us, the avoidance of the ejaculatory ducts is at least highly speculative and I have yet to see any operator other than the father of this operation executing the procedure in a way which seemed to me at all likely to lead to anything properly regarded as a conservative result. In my hands it could only be described as highly destructive. But the most difficult part of the operation is still to come. Dr. Young declares that the lobes are enucleated from inside of their capsule but it must be remembered that these lobes are covered by nothing properly described as a capsule but only by mucous membrane and a little fibrous tissue which adheres to the lobes with extreme intimacy. If these lobes are to be truly enucleated they must be enucleated from under the mucous membrane. This I do not believe to be an anatomical possibility as I have tried to remove this mucous membrane many times after the lobes had been taken out from above and have found it impossible even sitting quietly at the dissecting table. I present herewith specimens and illustrations which seem to me to show the absolute fallacy of the conception (Figs. 1, 2 and 3.) What does take place as a matter of fact in the hands of those who attempt the operation of Young is the enucleation of greater or smaller portions of these lateral and median masses from within the masses themselves, the amount of adenoma left behind depending upon the lines of cleavage within the mass and the experience and dexterity of the operator. The adenomatous tissue left behind violates the results of the operation in two ways. In the first place according to its amount and position it reproduces more or less exactly the form of the obstructing tumor present before operation which may flatten down considerably as the hollowed out cavities within it contract. It thus remains largely a matter of accident whether the relief to the patient is large or small. In the second place, a hardly

less serious objection is that from the adenomatous tissue left behind new masses are formed and the patient has no assurance that his obstruction is permanently at an end. I do not wish to convey the idea that prostatectomy as done by Young is not a benefit to his patients but the operation as described by him I believe to be faulty in conception and inefficient in execution in the hands of all but its distinguished author.

Since the term "conservative" has been applied to this method of perineal prostatectomy it seems to me that we are entitled to inquire of what the conservation consists. I have always assumed that the term was intended to apply to the conservation of the ejaculatory ducts the remaining prostatic tissue therefore the posterior lobe (misnamed surgical capsule) and the nerve fibers traversing the prostate and ending in the neighborhood of the verumontanum. If I have correctly understood the author it must now be abundantly clear that no such result can be expected from this operation. The attack traverses directly the only important part of the remaining prostatic tissue. The avoidance of the ejaculatory ducts is, to put it mildly, extremely problematical and it is far more sound to describe it as destructive than as conservative of these tissues. The operation by intra-urethral enucleation to a large extent avoids this damage and particularly when carried out from above may leave them almost wholly intact. I desire, however to repeat what I have elsewhere said that I think altogether too much stress has been laid upon the conservation of these structures. The end and object of the operation

of prostatectomy is to remove the obstruction, and no minor issues should blind us to the supreme importance of its absolute accomplishment. Since however stress has been laid upon this point it seems to me proper to point out that in this regard it cannot be accepted as accomplishing the end.

If I have made myself clear in what I have said above, it necessarily follows that for anatomical reasons which cannot be controverted prostatectomy must be done by some form of intra-urethral enucleation and it remains only to discuss whether the results are most satisfactory when this is undertaken from above or from below. Having regard only for the functional results, I believe that the suprapubic route is far superior. By this method it can be declared with certainty that if the patient survives the operation the function of the bladder will be restored practically to normal. By the perineal method of attack certain more or less objectionable sequelae not infrequently occur. The approach is such that the muscular control is jeopardized particularly in the case of large masses and a certain number of cases of incontinence more or less partial, is almost certain to result. Fistulae of various kinds always have and I believe always will, occasionally result those communicating with the bowel being the least common but most serious.

For these reasons it seems to me that in dealing with the type of prostate in which the obstruction results from the formation of adenomatous masses, the suprapubic route has a clear advantage over the other methods of attack.

BILATERAL URINARY CALCULI¹

By DANIEL N. EISENDRATH, M.D., CHICAGO

UNDER the above heading are included all cases in which calculi are simultaneously present in both halves or sides of the upper urinary tract, i.e., in the kidneys and ureters. The combinations in which bilateral calculi are most frequently encountered are (a) in both kidneys (b) in both kidneys and in one or both ureters (c) in the kidney of one side and the ureter of the opposite side (d) in the kidney of one side and the ureters of both sides, and, finally (e) in the ureters of both sides. These various combinations are shown in a diagrammatic manner in Fig. 1 and X ray tracings of practically all of the varieties are shown in Figs. 2 to 10 taken from cases observed at the Michael Reese Hospital during the past few years.

Calculi on both sides of the urinary tract present problems quite different at times from those of one side only. The questions which arise when one of the five previously mentioned combinations is recognized before operation vary greatly according first, to the functional condition of the two kidneys, and second as to whether calculous anuria is present or not.

There is one feature of the bilateral cases which, although not more typical of calculus formation on both sides than of unilateral disease, is at least of sufficient importance to be first considered. This is the tendency to the re-formation of calculi after removal from one or both sides. Under the head of treatment in this paper I will report two cases of this kind, and speak of occurrences in detail.

Another interesting fact in regard to bilateral calculus formation is the frequency with which the condition is found. A review of the few articles thus far published and a glance over our own large number of cases at the Michael Reese Hospital shows that in about twenty per cent of all patients in whom calculus formation has been found, either clinically (X ray examination, etc.) or at operation the condition was a bilateral one.

DIAGNOSIS

Clinical Pictures

Cases of bilateral calculus formation are usually seen presenting one of the following clinical pictures:

1 Cases showing the ordinary calculus (ureter or renal) symptoms on one side, but radiographs show calculi on both sides.

2 Cases with pain or other symptoms alternately on one side or the other and radiographs show calculi on both sides.

3 Cases presenting definite symptoms of calculus simultaneously on both sides. (These are comparatively rare.)

4 Cases seen either during an attack of calculous anuria or giving the history of transitory attacks of anuria with calculus symptoms in the intervals.

The well-known clinical fact that the pain may be referred to the side opposite to which the renal calculi are located must not be overlooked in connection with the first three groups. Aside from these clinical pictures there is absolutely nothing characteristic of calculi in both sides of the urinary tract to permit a differentiation from cases where they are located in one half of the tract only. I.e. in the kidney or ureter of one side.

For practical purposes then, one may divide cases of bilateral calculi into (a) those presenting the familiar symptoms of renal or ureteral calculi and (b) those seen during an attack of calculous anuria. The cases of Class a present themselves under one of the clinical pictures just described (1, 2 and 3). The cases included in Class b, i.e., calculous anuria, present such an entirely different clinical picture as to demand special recognition.

CALCULOUS ANURIA CASES

The majority of surgeons do not agree with the views of Kummell that an anuria is rarely due to the reflex inhibition of the secretory activity of one kidney when the opposite ureter is blocked by a calculus. Kummell,

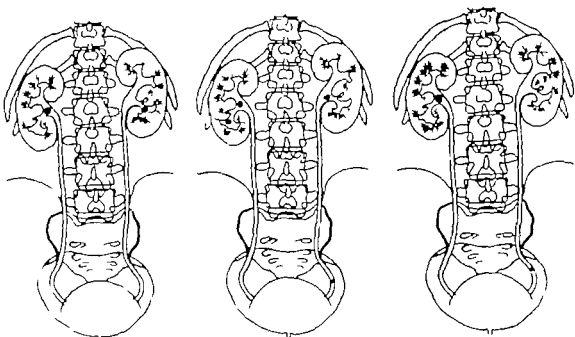


Fig. Combination No. 1. Calculi in both kidneys.

Fig. 2 Combination No. 2. Calculi in both kidneys and one ureter.

Fig. Combination No. 3. Calculi in right kidney and left ureter.

in other words, does not believe in a true reflex anuria but rather that when anuria exists both ureters are in all probability blocked. When anuria follows an operation for calculus on one side the opposite kidney has either been damaged by the anæsthetic or its ureter is blocked or there is a congenital lack of development of the opposite kidney present.

Calculus anuria is more likely to develop in cases of bilateral calculi than in unilateral cases. Kummell has had six cases of anuria in fourteen cases of bilateral calculi. Watson and Cunningham give the following conditions under which anuria develops when calculi are present and it is well to remember these when attempting to make a diagnosis in any case of anuria. These conditions are:

1. When the ureter of a solitary kidney is blocked by a calculus.
2. When both ureters are simultaneously blocked.
3. When one ureter is blocked and the other kidney is not developed.
4. When the fused ureter of two kidneys or the single ureter of a fused kidney is blocked.

5. When one ureter is blocked and the opposite kidney is reflexly suppressed.

The last named case of cases has been discussed above and the view of Kummell that a true reflex anuria does not exist is disputed by many surgeons. Watson has shown by clinical records and autopsies that Kummell's view does not hold for all cases.

As a rule, cases of calculous anuria are seen before uræmic symptoms have appeared. In a few cases death has occurred without uræmic symptoms and it is impossible to predict the time of the onset of uræmic symptoms. The average time of their appearance in sixty-two cases collected by Watson was between five and six days. In four it was as short as twenty-four hours and in fourteen cases it was between the tenth and sixteenth day.

The diagnosis, to be of any service, must usually be made during the 'period of tolerance,' i.e. between the appearance of the anuria and the onset of uræmic symptoms. The importance of such an early diagnosis is clearly shown in the statistics of Watson. In 205 collected cases 110 were treated expectantly with 80 deaths (73.7 per cent mortality).

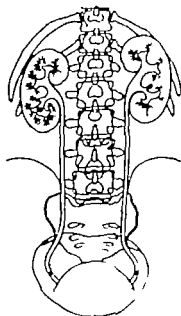


Fig. Combination No. 4. Calculi in one kidney and both ureters

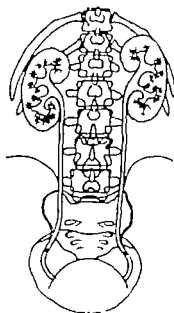


Fig. Combination No. 5. Calculi in both ureters

95 cases were operated with 44 deaths, i.e., 46.3 per cent mortality. If time and the local circumstances permit, an X ray is invaluable but this cannot always be done and the side to be operated on must depend according to Watson, on the history as to the side where the renal colics were felt, and upon the results of palpation. Tenderness and enlargement are the most reliable local signs, but are not always present. Of course the ideal method of diagnosis in cases of anuria would be to take a radiograph and thus locate the seat of obstruction. This is, however not always possible and one is dependent upon the clinical history and local findings alone.

VALUE OF X RAY

In every patient suffering with unilateral symptoms of either renal or ureteral calculus it is our duty to include both sides in our pictures. One can accomplish this by the use of a single plate large enough to include the entire urinary tract, as Caldwell and others do or by employing separate plates for the upper and lower portions of the urinary tract. Haensch and many other German

radiographers, and Lange of Cincinnati, prefer to employ five plates, one for each kidney one for the lumbar and iliac portions of each ureter and finally one to include the pelvic portion of both ureters and the bladder. The majority of radiographers who make a single exposure for the entire urinary tract omit the use of the Albarr-Schoenberg compression apparatus. Dr Frances Turley our radiographer at the Michael Reese Hospital, has obtained the most satisfactory pictures by the use of compression aided by the loofah pad of Stricker as described by the writer in a previous article. We find that in the ordinary individual both kidneys and the lumbar portions of both ureters can be readily included in a single plate, aided by compression and the loofah pad. The iliac and pelvic portions of both ureters and the bladder are then included in a second picture also aided by compression, etc. We have even been able to secure the shadows of both kidneys themselves in the majority of cases, if the patient is not too stout and if the alimentary tract has been thoroughly prepared.

The larger my experience in the interpreta

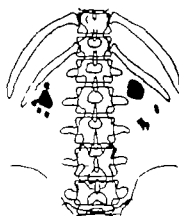


Fig. 2. Tracing of shadows in Case (Eric II) before first operation.

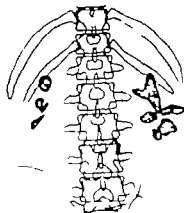


Fig. 3. X-ray tracings of Case after first operation. Note recurrence of multiple shadows in both kidneys.

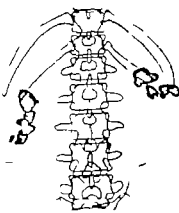


Fig. 4. Case After second operation by Dr. Berger showing shadows of second recurrence.

tion of radiographs of the urinary tract becomes the more I am convinced of the necessity of exclusion of shadows of gas or solid material in the intestines by careful preparation of the patient for at least twelve hours before the pictures are taken.

In this connection I need hardly call attention to the ease with which one can be led astray by finding an undoubted calculus shadow on one side and then assuming without further examination (by lead wire, etc.) that a shadow seen on the opposite side must necessarily be due to a calculus. Every condition giving rise to extrarenal or extra-ureteral shadows must be excluded as in the ordinary diagnosis of calculus. Caution in this direction only increases with experience and many are the pitfalls unless one bears in mind that an extraneous shadow may be present both in the case of undoubted unilateral or bilateral calculous formation.

TREATMENT

The question of operative interference varies according to whether the patient is seen during an attack of anuria or not. In the ordinary case, i. e. when anuria is not present, there is considerable difference of opinion as to whether the calculi are to be removed at one sitting or at intervals of four to six weeks. A second question to be answered is whether one is justified in removing an infected calculous kidney when the

condition is a bilateral one. The majority of surgeons believe that it is best to operate upon the worst side first and then operate upon the other side six to eight weeks later unless anuria occurs either during the interval, as the result of a reflex suppression of the other kidney or a blocking of the opposite ureter. This occurred in one of Cabot's cases on the eighteenth day after the first kidney had been opened for the removal of calculi. The worst side is determined by ureteral catheterization and the functional tests. Watson believes one should attempt to remove the calculi from both kidneys at one sitting under certain conditions. He operates first on the side which gave the last symptoms. If this first kidney is to be operated upon is seen to be of insufficient capacity to sustain life, he operates at once on the opposite kidney. If the first kidney is in good condition he operates on the second side after an interval. I believe that the position taken by Watson is the most rational one and was the method pursued in the cases of Dr. McArthur and the writer.

The question of nephrectomy depends entirely upon whether the opposite kidney is functionally incapacitated or not, and whether its ureter is likely to be blocked or not following the removal of the worse kidney.

When calculous anuria is present operation should be performed as soon as possible. One cannot stop to determine the functional

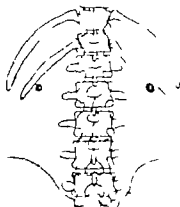


Fig. 5. X-ray tracing of Case after first operation by Dr McArthur showing shadows due to first recurrence.

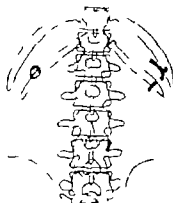


Fig. 6. Multiple calculi in left kidney and single large calculus in right kidney. Dr. Braunworth's case.

capacity and often not even to take an X-ray. The side should be chosen where the kidney is enlarged and tender and if the calculus on this side seems to be the cause of the blocking of the ureter further operation on the opposite side should be deferred to a later time. Even if the cause of the ureteral obstruction has been removed on one side, but the kidney looks as if it were of insufficient functional capacity. It is best to operate on the opposite kidney at once, i. e. at the same sitting.

The treatment of recurrences presents a new problem, well illustrated in the two following cases.

CASE. Eric H., aged twenty was first seen by me in October 1908 having been referred by Dr. Morthmer Frank. At the age of fifteen he began to have pain alternated over the right and left renal regions. During the first four years the pain had been chiefly felt over the right kidney, but in the year preceding my first examination the pain was usually localized in the back, over the left kidney. In July 1907 the pain which had been quite constant and of an aching character became quite severe over the left kidney and radiated along the ureter of the same side. This attack lasted three days, and was accompanied by chills and fever. He passed a small amount of "gravel" and blood during this attack. The patient showed me radiograph of the left kidney taken by another radiographer which showed number of typical stone shadows. This picture had been taken by a radiographer who although thoroughly competent, was satisfied that time (1908) to take a radiograph of only the kidney or ureter to which the clinical symptoms pointed. I immediately insisted upon having bilateral radiograph taken both from the

standpoint of thoroughness and because his pain had been referred for four years alternately to the right and left kidneys. The radiograph of the entire urinary tract showed (Fig. 5) a number of typical shadows scattered over so wide an area that one could readily diagnose either a prostatic or many dilated calyces filled with calculi. On October 30, 1908 the left kidney was exposed and fourteen phosphatic calculi were removed. They varied in size from pea to small marble. Most of the calculi were found lying in cavities which were evidently dilated calyces scattered throughout the kidney. Several calculi were in the renal parenchyma of the upper and lower poles. It had not been possible to estimate the functional capacity of the opposite kidney by ureteral catheterization before operation. Owing to the presence of a fair amount of apparently good parenchyma at both poles and the lack of knowledge of the condition of the other kidney a nephrectomy was deemed inadvisable. About eight weeks later (i. e., January, 1909) the opposite (right) kidney was exposed and seven phosphatic and pure uric acid calculi removed. The condition of this kidney was even worse than the left side, so that it would have jeopardized the patient's life to have removed either kidney. The calculi were found in the renal pelvis and in pockets lying just beneath the fibrous capsule of the kidney with very little intervening healthy parenchyma. The patient recovered rapidly but the urine continued to remain turbid and contained large number of colon bacilli and pus corpuscles. For one and a half years after the removal of calculi from both kidneys by the writer the patient worked steadily as lens grinder for an optical firm. Owing to the recurrence of pain over both kidneys, he consulted Dr. Berger of Chicago, who had radiographs of both kidneys made (Fig. 6). I am indebted to Dr. Berger for the courtesy of including them in the records of the case. These second radiographs showed an even larger number of shadows scattered

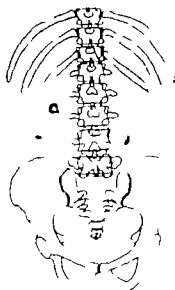


Fig. 7. Case showing shadows due to second recurrence.

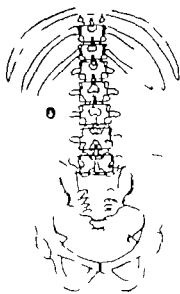


Fig. 8. Calculus in pelvis of right kidney and multiple calculi in opposite ureter. Drs. Steele and Carr' case.

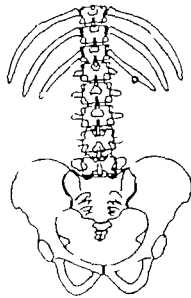


Fig. 9. Bilateral calculi left kidney and right ureter. Dr. Crofton case.

throughout both kidneys than I had found at my operation. Phosphatic material, partly formed into calculi and partly found as tenacious debris, was removed at two sittings by Dr. Berger from both kidneys in 1903. The patient again made rapid recovery from both of these nephrotomies, but the urine remained as turbid as after the previous operations. I ordered to gratify my curiosity the patient consented to a third series of radiographs of both kidneys made early in 1904 (Fig. 4). These pictures showed so many deep shadows over each kidney that it seemed scarcely possible for the patient to have so few symptoms. He is at the present time (December 1905) apparently enjoying the best of health unconscious of the fact that the second bilateral recurrence is even more marked than after the first operations.

So far as I can learn, this is the first case in which the recurrence of calculi in both kidneys has been so thoroughly controlled through repeated radiographic examinations. One can scarcely ascribe the shadows seen before the second nephrotomies performed by Dr. Berger and those now present to the fact that the calculi were overlooked since both Dr. Berger and I made a careful but futile exploration of every portion of both kidneys for further calculous deposits during our respective operations.

This case illustrates the necessity of making a guarded prognosis in regard to recurrence in

cases of bilateral calculi where (a) one cannot remove either kidney lest the other one be unable to do the work of both organs, or (b) where the pathological changes in the kidneys are such as to favor the formation of calculi if the original infection still continues.

CASE 2. Through the courtesy of Dr. L. I. McArthur to whom I am greatly indebted for the privilege I am able to add a second case of recurrence of calculi in both kidneys, in spite of two attempts at thorough removal of the calculi. The patient was a woman of twenty-seven who had first complained of severe pain over the right kidney in 1903 which had recurred at intervals for four years. She then began to have similar attacks of pain over the left kidney. The radiographs taken in March 1905 when she first consulted Dr. McArthur were negative. Owing to the predominance of the pain over the left kidney a nephrotomy of this side was performed. A calculus, the size of a pigeon egg, was removed from the left renal pelvis. A number of smaller calculi, which were found in the calyces of the same kidney pelvis, and one calculus in the parenchyma, were removed at the same sitting. In June of the same year (1905) a perinephritic abscess was opened through the nephrotomy (left) incision made earlier in the year. The kidney was explored at this operation, but no calculi found. In February 1906 the right kidney was opened and several calculi removed through a pyelotomy incision. One of the calculi filled the entire pelvic outlet and extended up into two of the calyces. A second calculus the size of marble was felt in the

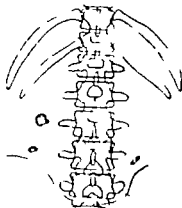


Fig. 5. Several calculi in right kidney and single pipe-like calculus at left uretero-pelvic junction.

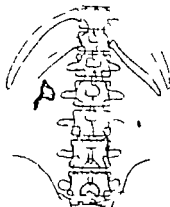


Fig. 6. Large coral-like calculus in right kidney and small calculus in pelvis of left kidney. Dr. McArthur and Eisenbraun case.

upper pole of this right kidney and removed through nephrotomy incision. About 10 years after the removal of the calculi from both kidneys she began to have pain over the right kidney and local evidences of a perinephritic abscess. The radiographs (see Figs. 5 and 7) taken in April, 1912 when her pain recurred showed typical stone shadow in the lower pole of the right kidney, large stone shadow in the lower pole of the left kidney and also shadow in the pelvic portion of the left ureter. All of her symptoms pointed to the right kidney only, the seat of the trouble since the left kidney was neither tender nor enlarged. It was only by a strict adherence to our rule of radiographic examination of the entire urinary tract that attention was called to the fact that the recurrence of calculi had taken place on both sides.

On April 4, 1913 Dr. McArthur opened the right perinephritic abscess and evacuated large amount of pus. The kidney was enlarged to double its normal size and the kidney was drained through its convexity after removal of a uric acid calculus, the size of bean, from its lower pole. It seemed inadvisable to remove the kidney. About three weeks later calculus, the size of pea, was removed from the pelvic portion of the left (opposite) ureter by an incision through the vaginal wall.

Legueu has had two recurrences in four bilateral cases. This is the only reference which I can find of recurrence in bilateral cases. Dr. Farr of Minneapolis, has kindly furnished me with the history of a bilateral case of recurrence. In 1905 he removed a calculus from the pelvic portion of the right ureter. In 1906 a calculus was removed from the left kidney. Later in the same year

a calculus was removed from the right kidney and from the right ureter at the point where the calculus was removed in the previous year. In 1907 calculi were again removed from both kidneys.

These cases of Legueu, Farr, McArthur and my own present a problem not hitherto considered and the danger of such recurrence both in respect to diagnosis and method of operation.

In the H.R. case (No. 1) of Dr. McArthur and in the E.H. case (No. 2) of the writer, calculi were removed most thoroughly from both kidneys or ureters at two sittings in each case. A glance at the X-ray tracings of my patient will show that almost as many calculi are present now as before the first or second operations. The question of why these calculi should have re-formed is necessarily so intimately associated with the entire problem of calculus formation in general that it would take us beyond the scope of this article to attempt to do more than simply mention it here. We know comparatively little about the underlying causes of or the conditions under which calculi form in the urinary tract. That infection plays a very prominent rôle is generally acknowledged, but it is not the only factor. In one of my own cases (E.H.) a chronic colon bacillus infection with seven calculi in one and fourteen in the other kidney was found in a boy of eighteen and it is fair to assume that it

had existed for many years before being seen by the writer. His bacillus coli infection has now persisted for the past six years, and has undoubtedly played the most vital part in the recurrence or re formation of the calculi in both kidneys. In Dr McArthur's case the conditions, in a young woman were quite similar.

We however see calculus formation on one or both sides in so-called aseptic cases, so that infection is not necessarily the only factor to be considered. Undoubtedly disturbances of metabolism alone play equally as important a part as infection in the precipitation of urinary salts and the formation of calculi. The problem of why one person should have calculi form primarily and another only secondarily i.e. when infection is present, is still unsolved. One must grant, of course that the calculi formed when infection is present are usually of a different nature usually mixed phosphates and carbonates. But why should they be deposited at one time and not at another?

This question is not only of theoretical but of great practical importance. We have known for centuries that bladder calculi frequently recur if the infection continues. We are just beginning to recognize the fact that under similar conditions calculi will re form in the upper urinary tract and we must be prepared to have this occur as it did in Dr McArthur's and my own cases unless we can get rid of the underlying factor namely the infection. Only one who has seen kidneys such as those of my E.H. case,

where it was necessary to save both organs because neither one by itself was capable of maintaining life can appreciate the apparent impossibility of eliminating the infection factor. We must in the future follow our cases of unilateral as well as of bilateral calculous disease in order to determine the frequency of recurrence and shape our prognosis accordingly. In other words we must not expect permanent relief through operative measures, if the original conditions favoring calculus formation persist.

In addition to the above two cases, we have had five other bilateral cases at the Michael Reese Hospital. One was not operated upon because the patient had a carcinoma of the uterus (Fig 6). In one case (Fig 8) the renal calculus was removed but the patient died some months later of a senile intercurrent disease before the opposite ureteral calculi could be removed. In one case (Fig 10) no operation was performed owing to an advanced pulmonary tuberculosis. In a fourth case (Fig 11) the calculi were first removed from the right kidney by Dr McArthur and after an interval of three months an attempt to remove a left-sided calculus by the writer through a pyelotomy incision was followed by such severe bleeding as to require removal of the kidney. This case has been reported elsewhere as showing one of the dangers of pyelotomy. The right remaining kidney continues to show negative shadows and the patient was three months pregnant at the time of writing this article and has been delivered of a normal healthy child since article was written.

THE INFLUENCE OF THE THYROID GLANDS ON PREGNANCY AND LACTATION¹

By WILLIAM M. THOMPSON M. D. Chicago

IT IS generally accepted that the thyroids are influenced to a marked degree by menstruation pregnancy and lactation but our knowledge thus far is chiefly clinical and has not yet approached that degree of accuracy necessary to a comprehensive understanding of the subject.

It is my purpose to correlate a certain amount of this clinical evidence together with some reports of laboratory workers and by adding a few experiments of my own to try to furnish a confirmatory contribution to this theory.

The statement of Dr. Miles F. Porter that in certain invertebrates the gland is a sexual organ and empties through a duct into the genital tract, suggests the idea that if it were possible to establish an anatomic connection in man or higher mammal a strong basis for the theory would be established. It is germane therefore to trace back the history of the work in this department, and the investigation carries us to the paleontologists who have found this connection to exist in some of the prehistoric ostracoda. I shall take the liberty of quoting from Gaskell (one of the best known observers in this field). In his chapter on the thyroid glands of the paleo-ostracoda, he says: "The thyroid gland is derived from the uterus of the paleo-ostracod ancestors. In one animal (the paleo-ostracod) the foremost pair of meso-omatic appendages forms the operculum which always bears the terminal generative organ and is fused in the middle line. In many forms, essential in Eurypterus and the ancient sea scorpions, the operculum was composed of two segments fused together: an anterior which carried the uterus, and a posterior which carried the first pair of branchiae. In another animal (ammonoites) the foremost segments of the meso-omatic or respiratory region (immediately in front of the glossopharyngeal segment) are supplied by the facial nerve and are

markedly different from those supplied by the vagus and glossopharyngeal, for the facial supplies two segments fused together: the anterior one, the thyroid gland and the posterior hyoid, carrying the first pair of branchiae.

Just as in Eurypterus, the fused segment carrying the uterus on its internal surface forms a long median tongue which separates the most anterior branchial segments on each side so also the fused segments carrying the thyroid forms in ammonites a long median tongue which separates the most anterior branchial segments on each side.

Finally, and this is the most conclusive evidence of all, the thyroid gland of ammonites is totally, unlike that of any other of the higher vertebrates, and indeed of the adult form the Petromyzon itself but it forms an elaborately complicated organ which is directly comparable with the uterus and genital ducts of animals such as scorpions.

The relationship which has been known from time immemorial to exist between the sexual organs and thyroid gland in man and other animal and has hitherto been a mystery without any explanation may possibly be the last reminiscence of a time when the thyroid glands were the uterine glands of the Paleozoic ancestors. *Changes in the sexual organs cause changes in the thyroid glands.* The activity of the thyroid begins with puberty and ceases with the menopause. Dr. Goodall and Conn among many others, have reported cases to verify this statement. Dr. Hertler after reviewing twelve cases, says that pelvic lesions and exophthalmic goiter coexist and that the pelvic lesions frequently precede hyperthyroidism. Cline speaks of the influence of exophthalmic goiter on sexual neurasthenia. Goodall and Conn note further that increased sexual function is a frequent cause of hypertrophy of the thyroid. Also that chronic inflammation of the uterine appendages, especially of the tuber

cular type causes increased thyroid activity and that the thyroid and ovary stand in relation not as compensators but as neutralizers. It is therefore easy to understand that changes in thyroid glands may influence changes in the sexual organs or vice versa.

Hyperthyroidism as a factor in the production of sexual changes has been known for several centuries but it was not until 1859 that Charcot, in his articles published in 1859 and 1862 brought the knowledge of the day into a logical and tangible form. Aran in 1865 in a paper before the Académie de Médecin laid great stress upon the influences of hyperthyroidism in effecting disturbances of menstruation. Goodall and Conn cite a number of authors in defence of this theory, agreeing with others that it is the ovary that is directly influenced. It has been shown that there are two secreting structures in the ovary. The first the corpus luteum, which develops periodically and has a special relation to pregnancy in that during pregnancy it develops enormously and in addition, in order to meet the demand upon the ovary every other Graafian follicle develops a large ring of lutein cells around it.

The second are the interstitial cells of the ovary and they are more uniform in their secretion and of longer life than the sexual life of the woman. It has been further shown that the secretion which most influences the thyroid is from the interstitial cells of the ovary. For if intercourse or any repeated cohabitation cannot cause the ova to ripen at irregular periods it does increase the interstitial secretion and hence thyroid hyperactivity follows.

Pinard records nine cases in which exophthalmic goiter showed unmistakable connection with ovulation. Stowe reports a case of Basedow's disease associated with pregnancy that led to a fatal termination. He believes it to be a rare complication of pregnancy and that its relation thereto is shrouded in mystery.

PROPORTION OF FEMALES TO MALES WITH HYPER- AND HYPERTHYROIDISM

According to Osler the proportion of females to males afflicted with thyroid disease

is about 8 to 1. The majority of cases of exophthalmic goiter occurs between the ages of 16 and 40.

Porter states that thyroid disease is about five times more prevalent in women than men. This statement is corroborated by Drs. Marne and Lenhart, who maintain that starting from puberty active hypertrophy is more common in females. The clinical evidence is estimated to be from 3 to 1 to 6 to 1. After puberty colloid glands are more common in females for the reason that hyperplasias are more common. Rübsamen states that he found 34.2 per cent of 718 women in the Maternity at Berne had goiter that is, 246 while at Dresden there were only 20%.

The behavior of the thyroids during pregnancy is an interesting subject about which but little is known. My attention was definitely attracted to this obscure department of physiology by a patient who came to the clinic at St. Joseph's Hospital. She appeared to be about four months pregnant. She had an hypertrophied thyroid but no symptoms of thyroidism. Two weeks later she returned and announced that she had visited another hospital and had the largest lobe removed. I believe she neglected to tell the surgeons of her pregnancy. I observed her closely for about three weeks and noticed that the uterus steadily decreased in size until it was almost normal and as firm as a non-pregnant organ. She reported no bleeding. Later she was curetted of some atrophied decidua and villi. In six months this woman again became pregnant. The remaining thyroid was much enlarged up to the fourth month. She had a normal labor and the thyroid subsided.

It is not possible to enumerate the literature of thyroids and pregnancy in a paper of this character so I will confine myself to citations from some of the more important reports.

Ciullo concluded that the suprarenal capsules, the pituitary body and the thyroid became hyperæmic and hypertrophic during pregnancy. Second the parathyroids show no increase in their functional activity during pregnancy but that this occurs during the puerperium.

In a later report he states that "the thyroid hypertrophies, softens, and becomes more vascular microscopically its capillaries are seen to be dilated and full of red globules. Second its functional activity is indicated by its secretion (a) of granules and (b) of colloid substance."

The toxemia of pregnancy and thyrotoxicosis has proven a fertile field for investigation. Dr. Charles H. Mayo recommends thyroid extract for the extreme vomiting. Dr. Porter expresses the opinion that the toxemia of pregnancy and puerperal infections were probably often due to thyroid activity.

Dr. George Gray Ward in his first article concludes that (1) The thyroid gland is in all probability concerned in promoting nitrogenous metabolism. (2) That the gland normally hypertrophies during pregnancy. (3) That failure of the gland to hypertrophy during pregnancy may result in the various forms of toxemia of pregnancy. (4) And in Graves disease during pregnancy he recommends the administration of thyroid substance. Subsequently in discussing the same subject he makes two classifications (a) cases having no Graves disease but without sufficient thyroid secretion to promote the increased metabolism in the liver made necessary by pregnancy (b) cases associated with Graves disease.

For the a group he recommends thyroid substance. For the b group he says it is essential to determine whether Graves disease is a condition of hyperthyroidism or of hypothyroidism. In the former he recommends rest, lee pack, and the cryo-toxic serum of Beebe and Rodgers for the later thyroid substance.

In a critical review of the work on exophthalmic goiter and pregnancy, labor and the puerperium Dr. Clifford White classifies the subject under three heads (1) The influence of child bearing on the goiter (2) The influence of the goiter on child bearing (3) The condition of the child born of exophthalmic mothers.

After quoting writers from Aclima (1867) to the present time who reported cases of exophthalmic goiter occurring during pregnancy also those reporting cases of Graves

disease accompanying the toxemia of pregnancy he concludes that there is little doubt that Graves disease strongly predisposes to sterility.

If pregnancy takes place premature labor and antepartum hemorrhage occasionally occur pregnancy is an important factor in the disease and on the whole makes it worse. Patients may improve toward the end of pregnancy but are again made worse by labor and as I myself have observed, also by lactation.

Dr. Reuben Peterson declares that enlarged thyroid is not uncommon in pregnancy and especially with eclamptic convulsions.

B. V. Beck had 420 patients apply for relief from thyroid symptoms during the course of their pregnancy. In 260 of this group there had been preceding symptoms of hyperthyroidism. At the end of the fifth month the signs of thyroid hyperfunctioning subsided except in five of the ten cases of pronounced exophthalmic goiter. His experience warns that no operative measures should be attempted not even artificial delivery in severe exophthalmic goiter with perishing thymus. The treatment can be only internal and directed against the thyrotoxicosis.

Dr. Chas. B. Reed cites Lang's work, which extended over four years. His results were that a hyperplasia of the thyroid gland is physiologic in pregnancy. Pregnant animals (cat) require for the maintenance of their health larger thyroids than the non-pregnant. After the total extirpation or the removal of more than four fifths of the thyroid in pregnant animals, tetany occurs but is promptly relieved by the administration of thyroidin.

"Lang examined 133 pregnant women and in all but 25 of which were doubtful he demonstrated thyroid enlargement at some period of the pregnancy. In the 18 cases wherein the gland was not enlarged there was absolutely demonstrated pregnancy kidney and albuminuria.

THE INFLUENCE ON THE FETUS OF MATERNAL GOITER

Ribbaumen details nine cases of congenital goiter in which the mothers had goiter. Dr. Church delivered an exophthalmic mother of

twins one died and the other was epileptic. There was epilepsy in the family.

Dr F J Poynton described a case of a mother with Graves disease being delivered at the age of 25 years of a child that at the fourth month was a typical cretin.

Ochsner and Thompson show photographs (Schmauch's case) of a child with Graves disease whose mother also suffered from this affection. Schmauch says that in most instances there has been no transmission of this condition from mother to child also that in a large proportion of cases abortion is the result in exophthalmic goiter.

Porter avers that goiter in the mother often produces bone deformities in the offspring. Dr Barry characterizes the thyroid gland at birth as almost solid and containing little colloid. Ballantyne quotes Svehlä who states that the fetal thyroid does not contain any substance to accelerate the pulse.

THE INFLUENCE UPON LACTATION

Hertoghe believes that thyroid given to lactating women increases the flow of milk, and Bang states that the active principle is excreted by the milk.

More and Cathala report a case where a marasmatic goitrous child improved rapidly when thyroid was administered to the nurse.

Bramwell noted symptoms of hyperthyroidism in a child each time that thyroid extract was given to its mother who was suffering from Graves disease which had developed during pregnancy. Clullo concludes that both glands (thyroid and parathyroid) have an important effect upon lactation citing Almagna's experiments, who removed the thyroid apparatus from young puppies they showing no ill effects, while being weaned but when this was suddenly stopped the animal died.

The foregoing is, I believe sufficient to establish the theory as a legitimate field for further inquiry.

I shall terminate my paper with some reference to the laboratory evidence. While the work of Dr. David Marine and C H Leonard concern chiefly the pathology and the relation of iodine to human thyroids, nevertheless they have reported interesting experi-

ments on three pregnant bitches, which I take the liberty of summarizing.

Bitch A gave birth to normal pups after one lobe had been removed and iodine administered. The fifth pup was born dead.

I A 104 after litter (normal pups were born the dog again became pregnant, and one and two thirds of the thyroid lobes were removed which were pure colloid. In this second litter the pups thyroid was slightly enlarged and histologically in a state of early glandular hypertrophy.

In A immediately after impregnation one and two thirds lobes were removed which histologically were in state of moderate glandular hyperplasia. Of the two pups born one died at birth, and the other — which was given iodine — lived.

Dr Halsted of Johns Hopkins is said to be the first to have produced and to have recognized the experimental production of congenital thyroid hyperplasia in dogs. His observations made in 1888 and 1889 include three litters of goitrous pups from different bitches. All those bitches had their thyroids removed (from 1 to 1/2) prior to impregnation. L. Algner and L. Thunveny published the results of 11 experiments relative to the condition of the ovaries of bitches having undergone total extirpation of the thyroid and parathyroid apparatus.

Experiments 1 and 2 were on pregnant bitches. In 1 total thyroidectomy with partial resection of parathyroid was performed. Two months later the bitch died and the uterus was found to contain 6 young ones about term. In 2 the bitch underwent unilateral thyroidectomy 6 weeks later she bore 6 young ones which died within 48 hours.

Experiment 3 was a bitch with voluminous breasts containing plenty of milk. Operation was followed by typhoid, pyrexia and urinaemia and death on the twenty-second day showing that thyroidectomy is particularly badly borne during lactation.

The other 8 experiments were made to show the influence of thyroidectomy on the ovary which they say scarcely seemed to be affected either in its structure or in its evolution. They report that clinically the unfavorable influence of thyroidectomy upon different manifestations of sexual activity has appeared to us very clear conforming to the results already found by other experimentalists. The menstrual period appears less frequent and of particularly short duration. Conception is more difficult to obtain."

In May 1911 I began experimenting on pregnant bitches with the object of ascertaining the effect of disturbances of the thyroid apparatus during the height of sexual activity. In all 9 dogs were operated on. In 5 dogs one lobe of the thyroid was removed. In two one lobe was removed and the remaining thyroid tissue badly bruised and ligated and in one both lobes and some parathyroid were removed. In one both lobes were removed and one lobe and hypertrophied thyroid were removed from another dog and implanted in the site of the excised gland.

Dog No. 1. Black and white fox terrier supposed to be 8 weeks pregnant. May 8th 1911 removed right lobe of thyroid. May 10, condition good and healthy. May 3 condition good. May 7th five puppies were born condition good; milk abundant. May 9 dog and puppies ill. May 27 dog and puppies well and healed. June 3, bowing milk abundant. June 10, dog and puppies ill. June 15 dog and puppies ill milk abundant.

Dog No. 2. In which both lobes were removed died on the table leaving 8 to be considered.

Dog No. 3. White fox terrier supposed to be pregnant about 8 weeks. May 26 1911 removed right and left lobes of gland and some parathyroid tissue. May 7 dog appeared sick. May 8th, slightly better refused food drinks water. May 10th, dog very sick trembling and rigidity. May 10th dog condition very bad difficulty in moving tremors five puppies are born. Milk glands soft and flabby. May 13 dog worse 3 puppies found dead, no milk in glands. June 2d, dog and remaining puppies found dead.

Dog No. 4. Black-and-tan operated May 30. 9. Removed right lobe of thyroid and bruised left lobe. May 31st dog's condition bad takes water but no food. June 1st dog stands with difficulty tottering on attempting to walk trembling bowels move refused food but takes water and soup. June 2d, dog very ill around discharging; refused food; drinks great deal much urine. June 3d dog very ill puppies were born dead around discharging. June 4th, dog dead.

Dog No. 5. Vigorous female mongrel, operated July 5, 9. Left lobe removed. July 7th, condition good began feeding. July 8th, condition the same, bowels moved. July 9th condition good. July 11st around discharging. July 12d wound opens somewhat condition good. July 14th the same. July 15th, wound still discharging. July 16-7 dog in good condition. July 18th, five puppies born breasts contain abundant milk. July 19th, dog runs about and barks a great deal puppies nursing. July 20th, dog still angry four puppies found dead. July 31st, dog and puppy well

plenty of milk. August 1 the same. August 3d, dog well puppy dead. Post-mortem on puppy liver crushed.

Dog No. 6. Adult female mongrel, supposed to be pregnant and near term. July 26th, removal of left lobe considerable hemorrhage, traumatized remaining thyroid and parathyroid in controlling hemorrhage. July 27th dog appears ill trembling refused food dirt in water with sugar. July 28th stands and walks with difficulty; tremblings wound healthy refuses food but drinks. July 30th, dog very ill refused food frequent anasthesia. July 30th, dog very ill; one July 31st, dog and no puppy found dead. Owing to the hot weather no post-mortem was possible.

Dog No. 7. Large vigorous black-and-tan, supposed to be about 8 weeks pregnant. Operated the first week in October. Both lobes removed one lobe and an hypertrophied thyroid taken. The same sitting from another dog and implanted in wound. Dog made a good recovery. Two weeks later dog escaped from pen and was lost.

Dog No. 8. Fox terrier said to be about 8 weeks pregnant. October 3, 91 removed right lobe good recovery. Nov 8 1911 four puppies born milk abundant.

Dog No. 9. Mongrel. Removed right lobe on January 7 1912. January 8 condition good. January 14 puppies born glands contain abundant milk.

In summarizing these we find that dogs No. 1, 5, 8, and 9 in which one lobe of the thyroid was removed with no accidents gave birth to normal puppies and had abundant milk. That dog No. 4 in which the remaining thyroid was bruised had a stillbirth and died. That dog No. 6 which had a severe hemorrhage during the operation, in the control of which there was sufficient injury to the remaining thyroid and parathyroids equivalent to a ligation of the artery had one puppy born dead and succumbed herself. That dog No. 3 on which double thyroidectomy was performed together with the removal of some of the parathyroid tissue had symptoms of tetany gave birth to five living puppies, but appeared to have no milk, and that the dog and puppies all died in a few days. It is unfortunate that dog No. 7 escaped, as it would have been interesting to observe the effect of thyroid transplantation on the puppies.

It will be seen from the above that the removal of one thyroid gland has comparatively little influence on pregnant dogs or their pups after birth, but that the removal of

one half with injuries sufficient to destroy the function of the remaining thyroid and parathyroid tissues is followed by tetanic seizures and death of mother and puppy. That the total removal of the thyroids with some parathyroid tissue is followed by trembling rigidity and that after the birth of the puppies the milk was scanty and later the mother and puppies succumbed.

CONCLUSIONS

1. That the thyroid gland, situated as it is in the neck should have any sympathy with sexual functions if it was originally a gland concerned with digestion is, to say the least of it extremely unlikely but on the contrary likely enough if it originated from a glandular organ in connection with the sexual structures of the palaeostrean ancestor.

2. That there is clinical and experimental evidence of its connection with the sexual system of man and higher mammals through its secretions in that a lack of thyroid secretion influences sexual activity adversely, that sexual activity whether it be physiological or pathological causes a hyperactivity of the thyroid and that this hyperthyroidism constitutes an index to the toxæmia of pregnancy to counteract which the thyroid raise their antitoxic protective power.

3. That there is abundant clinical evidence in support of the theory that what is termed a physiologic hyperactivity of the thyroid is a valuable safeguard against the toxæmia of pregnancy.

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DEPARTMENT OF TECHNIQUE

CHOLECYSTOSTOMY BY OBLIQUE FISTULA

By JOSEPH WIENER, M. D. NEW YORK CITY

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DURING the past twenty years the writer has been following the gamut of surgery of the biliary system. In the old days we had cholecystostomy at first in two stages, on account of the frequency with which the peritoneum was infected in the one stage operation. As our experience increased and the incomplete result of the two stage operation became more and more apparent, the one stage cholecystostomy became the operation of choice. Owing to faulty technique we frequently saw biliary fistulae persisting for months and years. Then about ten years ago, we began to do cholecystectomy on a large scale and our results improved very much, but the mortality was high. But in our enthusiasm at the good results obtained, the pendulum swung too far forward in favor of cholecystectomy. As has so often happened before in other procedures, the pendulum is again swinging somewhat backward if we can call it backward, at least in certain cases toward cholecystostomy. Up to ten years ago the writer regularly did the old cystostomy operation. Then, for a few years, cystectomy was the operation of choice in more than seventy five per cent of the cases. During the past six or seven years we have given considerable thought and study to this subject. We have long thought that if we could eliminate some of the drawbacks of cystostomy by perfecting the technique of the operation, much good would result. Why? In the first place, we cannot deny that the gall-bladder has a function and especially in younger subjects we like to keep all organs intact for future use. True it is that thousands of patients have had their gall-bladders removed, and are well and happy. We have ourselves contributed a fair number to these many cases, and in some of these cases we were personally very much interested in getting as good a result as possible. We have numerous such cases that have remained well for eight and ten years after removal of the gall-bladder. Nor do we wish to glorify the impression

that we have given up doing cystectomy. However all surgeons the world over are agreed that there is a higher mortality following cystectomy than following cystostomy. The difference in the percentage of mortality following these two operations varies considerably with different surgeons. The selection of cases and the personal preference of the surgeon no doubt color the figures. But every surgeon reporting a large number of cases has a decidedly higher mortality from cystectomy than from cystostomy.

What then are the drawbacks and objections to cholecystostomy and why do we or did we so often remove the gall-bladder? The four chief drawbacks enumerated against cystostomy are: 1. Persistent fistula. 2. Post-operative pain and discomfort. 3. The reformation of stones. 4. Cancer.

1. Persistent fistula. The only cases of persistent fistula after our method have been in cases of stricture of the cystic duct or empyema of the gall-bladder. We no longer do a cystostomy in these two classes of cases. I none of our other cases, except in one reported below have we seen persistent fistula. And in this one case I had subsequently remove stone which we had probably overlooked at the first operation. But it is only too true that we often did have persistent fistulae following the old cystostomy and cystostomy operations. It was largely to overcome this that we have gradually developed the technique which we now employ with such gratifying results. I spit of errors made in our earlier cases and unnecessarily complicated technique: the average stay of our cases at the hospital during the past four years has been twenty-one days after operation. Of late by simplifying our method of suture and materially lessening the amount of drainage we are reducing the time to two and half weeks. Thus we believe eliminates the question of persistent fistula.

2. Post-operative pain and discomfort. With the old operation we sutured the gall-bladder to

the parietal peritoneum all around, and used numerous gauze packings besides. Much of the pain our patients formerly complained about for months and years was due to the extensive adhesions resulting from these two mistakes in technique of which we in common with most others, were often guilty. As we will point out in describing our technique we no longer fasten the gall-bladder all around to the parietal peritoneum, and we are using less and less drainage. The result is that our patients are becoming more and more comfortable after operation.

3. *Reformation of stones.* It is extremely rare that this takes place. If it does take place, we must not forget that it may take place in the stagnant bile in the ducts following the removal of the gall-bladder as well as in a gall-bladder that has been left in situ. True, we have all had to do secondary operations on gall-bladder and ducts to remove stones, but in almost every one of these cases the stones had already been present at the first operation. In some cases they may have been high up in the hepatic ducts and inaccessible at the first operation. Occasionally we leave portions of a crushed stone, or detritus, that forms the nucleus for the growth of a stone. Such cases we have all observed, both after cystostomy and after cystectomy. Nor is it always of necessity the fault of the surgeon that a stone or portions of a stone is left behind. Many of these cases, especially if operated on during an acute attack, are not good operative risks. Often the anesthetist will warn the operator that further procedure would be hazardous. Is it not better in such cases to desist from further search for stones—which may or may not be present—rather than endanger the life of the patient? But when all is said, the number of cases in which stones re-form in the gall-bladder after all stones have been removed at operation, is extremely small. So small is it that some good observers declare that they have never seen a simple case. And we must not forget that with patent ducts small stones that are left behind will often pass into the duodenum. Furthermore in our technique we are now irrigating the gall-bladder through the drainage tube daily after the fourth or fifth day. In this way we have several times washed out small stones that came down from the hepatic ducts following the operation. We have in several cases of acute cholecystitis that were not in good condition, found the hepatic ducts packed full of small stones. To slit up the hepatic ducts in such cases in order to remove every stone is to court disaster. We have repeatedly cured these cases by milking out as

many stones as possible, and irrigating the gall-bladder for ten days after operation. Of course we are now referring to acute cases in poor condition, where a prolonged operation will often mean the death of the patient.

4. *Cancer.* The danger of cancer developing in a gall-bladder containing an ulcer or stones is no doubt a real one, but the danger of cancer developing in a gall-bladder that no longer contains stones or ulcer is, we believe a small one. In cases of gangrene or extensive ulceration of the gall-bladder we regularly do a cystectomy.

Choice of operation. It is not our purpose to compare cystostomy with cystectomy. Each has its field, but we believe that we have materially widened the field of cystostomy with a resulting lowering of the mortality rate. So much has been written of late on the indications for cystectomy that one is led to believe that there is hardly a unanimity of opinion on the subject. New growths, gangrene, extensive ulceration, empyema, stricture of the cystic duct, atrophy or marked hypertrophy of the gall bladder, extensive pericystic adhesions—all these are rightly mentioned as indications for cystectomy. But there are a goodly number of cases that do not come under these categories. I shall not enumerate them in detail, but, from the case reports, a fairly good idea will be obtained as to the class of cases in which we perform our operation.

The cases that form the basis of this paper were operated on by the writer in the service of Dr. Howard Libenthal, at Mount Sinai Hospital, and I am indebted to Dr. Libenthal for his courtesy in allowing me to publish the cases. The details of technique we have gradually been perfecting over a period of more than five years. We will only report cases operated on since 1909, as in the earlier cases, we were more or less groping in the dark. Even in the last three years we have made numerous changes in our procedure. We formerly used linen thread to suture the tube into the gall-bladder but we now use only plain catgut. Linen, and even chromic catgut knots can and do form the nidus for the future development of gall-stones. A recent writer reports a secondary cystostomy at which he found three chromic gut knots in the gall-bladder, each one forming the nucleus of a stone. Until recently we sutured the gall-bladder to the parietal peritoneum. Not only is this a time consuming procedure, but it actually does harm by causing post-operative pain, due to extensive formation of adhesions. By now omitting this suture we save considerable time—especially in obese subjects, the patient is more comfortable after operation, secondary

DEPARTMENT O

CHOLECYSTOSTOMY BY

By JOSEPH WJENIER, M. D.

Adjunct Surgeon, M. D.

DURING the past twenty years the writer has been following the gamut of surgery of the biliary system. In the old days we had cholecystostomy at first in two stages, on account of the frequency with which the peritoneum was infected in the one stage operation. As our experience increased and the incomplete results of the two stage operation became more and more apparent the one stage cholecystostomy became the operation of choice. Owing to faulty technique we frequently saw biliary fistulae persisting for months and years. Then, about ten years ago, we began to do cholecystectomy on a large scale and our results improved very much, but the mortality was high. But, in our enthusiasm at the good results obtained, the pendulum swung too far forward in favor of cholecystectomy. As has so often happened before in other procedures the pendulum is again swinging somewhat backward, if we can call it backward, at least in certain cases toward cholecystostomy. Up to ten years ago the writer regularly did the old cystostomy operation. Then for a few years, cystectomy was the operation of choice in more than seventy five per cent of the cases. During the past six or seven years we have given considerable thought and study to this subject. We have long thought that if we could eliminate some of the drawbacks of cystostomy by perfecting the technique of the operation, much good would result. Why? In the first place we cannot deny that the gall-bladder has a function and especially in younger subjects we do not keep all organs intact for future use. True it is that thousands of patients have had their gall bladders removed, and are well and happy. We have ourselves contributed fair number to these many cases, and in some of these cases we were personally very much interested in getting as good result as possible. We have numerous such cases that have remained well for eight and ten years after removal of the gall-bladder. Nor do we wish to give the impression

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Read before the Surgical Section of the New York Academy of Medicine

In either case is the same. We now use plain catgut exclusively for these sutures. If they have been properly applied we find that the tube is held very firmly and cannot be displaced even by using considerable force. However we usually pass one suture partly through the wall of the bladder and through the tube, to make doubly sure the tube will remain in place. We no longer suture the gall-bladder all around to the parietal peritoneum. Sometimes we pass one of the through-and-through chromic gut sutures that close the abdominal wall partly through the wall of the gall bladder but even this is not necessary. Very little drainage is required. We formerly used gauze packings around the bladder but, with increasing experience we found that in most cases a drain of rubber dam placed under the fundus of the gall-bladder and wrapped around the tube was all that was needed. We sometimes close the abdomen with three layers of sutures: plain gut for the peritoneum, chromic for the rectus and its sheath, and silk for the skin. Often we use only two layers through-and-through number three chromic gut sutures to include all layers except the skin, with a few fine chromic sutures for the anterior sheath of the rectus, and silk for the skin. After the fourth day the gall-bladder is irrigated daily with saline or a weak astringent solution. Sometimes we start this irrigation before the fourth day. We believe that these irrigations shorten the time of convalescence, they remove inspissated bile and small fragments or even complete stones. The drainage tube is connected with a bottle attached to the patient's bed. During the first few days the drainage is usually profuse, then soon becomes less. The first dressing is done on the seventh or eighth day when the rubber dam drain is removed. We usually remove the tube between the tenth and fourteenth day and are guided somewhat thereby by the character and amount of bile being drained, and also the general condition of the patient. The patient gets out of bed about the twelfth day and leaves the hospital, usually with a superficial sinus, about the twenty-first day. We have given up external gauze drains, as they are not necessary with our technique, and they undoubtedly delay convalescence. We have also found that if gauze or rubber dam drains are left more than a week after operation the healing of the wound will be delayed. This we believe is due to the development of a firm wallled fistula which takes a very long time to fill in.

To get the best immediate as well as remote results, attention to all the apparently unim-

portant points we have mentioned is, we believe, essential. Letting the first dressing go until the twelfth day may delay the healing of the wound for several weeks. The same is true of using numerous gauze drains around the gall-bladder. Since we use very few drains our wounds are healing more rapidly. As regards the immediate result of operation, we consider the duration of operation of the greatest importance. Other things being equal, if we take a series of these cases and subject them to operations lasting over an hour we will have a higher mortality, a more stormy convalescence and more complications than if we perform quicker work. Many if not most of these patients are obese and they stand either none too well. If we operate over an hour they are taking ether almost an hour and a half. This in itself is a very serious matter aside from the prolonged operative procedure with its exposure of important vessels and organs. We cannot too strongly emphasize our belief that time is a very essential factor to success in this work. We have computed the average time consumed in doing our cholecystostomy operation during the past four years and found it to be less than thirty nine minutes. In most of the cases we sutured the gall-bladder to the peritoneum. This takes several minutes, and we now dispense with it and thus shorten the time of operation still more.

In the following case the operation was done during an acute attack, and we believe the after-treatment was materially shortened by irrigations of the gall-bladder with weak solutions of tannic acid.

Fanny E., 45 years, admitted August 2, 90. One year before she had an attack of right hypochondriac pain with chills, fever and constipation. These attacks had recurred frequently. Four days before admission there was severe attack with vomiting and fever. There was moderate tenderness over the entire abdomen, especially in the right hypochondrium. The gall-bladder was found somewhat distended, the ducts free of stones but adhesions around the cysts. The gall-bladder, as aspirated, then opened, and many stones as large as cherry pits removed. The usual tube drainage was employed. Time of operation, ninety minutes. Five days later the gall-bladder was irrigated and thick mucus washed out. Thereafter irrigated daily with saline and weak tannic acid solutions. On the eleventh day the tube was removed and on the twentieth day the wound was healed.

Remarks. After operations for acute cholecystitis we are making it a practice to irrigate the gall-bladder daily after the third or fourth day and we keep up these irrigations until the bile drained from the tube becomes perfectly clear. This is usually about the tenth or twelfth day after operation. We believe it is fair to assume that these irrigations with astringent solutions

do hasten to allay the inflammation in the gall bladder and thus shorten convalescence.

One of the most rapid cures we have had in these cases was the following:

Eliza C., 35 years, admitted July 7, 1901. During the previous eighteen months she had had attacks of pain in the right hypochondrium, radiating to the back and right shoulder. Following the birth of child, 12 months before admission, there had been frequent attacks of pain with vomiting and chills sometimes. There was moderate tenderness in the right hypochondrium. T 100.4 P 88, R.

At the operation I found some adhesions around the gall-bladder, which was not distended and contained 1 stone. The usual tube drainage was instituted. The operation took 35 minutes. The tube drained small amounts of bile for five days, and the gall-bladder was irrigated through the tube with saline solution. The first dressing was done on the eighth day and on the eighteenth day the wound was healed.

Remarks. We have often been able to send these cases home with superficial sinuses two and a half weeks after operation, but we think it rather unusual after any operation on the gall-bladder or ducts to have the wound completely healed in so short a time. We dwell on this fact particularly because some men object to cholecystostomy on account of the prolonged after-

treatment. With the method we employ prolonged after-treatment is a great exception. With the older methods of cholecystostomy which we believe are still practiced by some men, a biliary fistula often persists for many weeks. As we have before remarked, it was largely to overcome this tendency to the development of a prolonged biliary fistula that we have been striking a device new technique.

We would again state that during the time we were doing this type of operation we were also doing cholecystectomy in cases which we considered suitable for this operation.

We believe that the operation which we practice has the following advantages:

1. Low mortality.
2. Low morbidity.
3. Retaining the function of the gall-bladder.
4. Rapid healing of the wound.
5. No danger of permanent fistula.
6. Ease of secondary operation, if one becomes necessary.
7. In cases of icterus, as there is not much dissection required, there is less danger of post-operative hemorrhage and shock.
8. As there is no leakage around the tube, no gauze packings are needed, and in consequence the healing is rapid.

A GASTROSTOMY SUGGESTION

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AFTER a moderate experience in this work the following conclusions seem to me justifiable: (1) There is no ideal method, judged by the number of different operations still in use. (2) All methods produce an adequate valve are usually failures, because as contraction occurs, the original channel becomes an ordinary opening. (3) The mortality is higher than it should be for such a simple procedure. This last statement may be questioned by many as their personal experience may be quite the reverse but for the most part, however, these patients are in particularly desperate condition, because of starvation and any operation is necessarily severe. In addition as these cases are usually malignant sutures do not hold well, and leakage is not infrequent. Finally when the stomach has markedly contracted early feeding produces marked pull on sutures, and is a frequent cause of leakage.

In an effort to change this situation, I stumbled on a method which was new to me although I do not doubt it has been used by others name-

ly when the catheter is introduced into the stomach in any method, *pass it immediately through the pylorus into the duodenum*. This procedure enables one to proceed with feeding at once without fear of tension on the stomach sutures. The catheter is borne well by the duodenum, as I have never seen any irritation due to it. In the course of three or four days the catheter is withdrawn into the stomach, the exact point of the catheter being previously marked.

The advantages of this method in desperate cases are self-evident. It not only offers a safe method for the immediate introduction of food, but also insures certain and definite means of introducing salt solution or tap water into the circulation. It offers the same advantages to gastrostomy operations that McArthur's procedure gives to surgery of the biliary passages.

Whether this feature is new or not, I cannot say with certainty but I have been unable to find any reference to it in the literature.

AIR IN THE VENTRICLES OF THE BRAIN FOLLOWING A FRACTURE OF THE SKULL

REPORT OF A CASE

BY W. H. LUCKETT M. D. New York City

THERE may and probably have occurred just such accidental conditions as is hereinafter described, but if so, they were never recorded in medical literature. Rawling, in his *Surgery of the Skull and Brain*, speaks of surgical emphysema resulting from fractures in opening the frontal, ethmoidal, and mastoid sinuses. We venture to publish this case as the first on record of air in the ventricles of the brain, diagnosed as such before operation, found to be so at operation, and lastly proven to be true at autopsy.

E. K. 47 years old, machinist, was admitted to my service at the Harlem Hospital November 24, 9, with the following history: Patient as struck by trolley car and thrown to the pavement, recent laceration of the scalp. On admission (temperature was 97.8° pulse 72 and respiration 23).

Physical examination. White male 47 years old weight about 150 pounds, 55 nourished and developed, conscious and rational. Pupils react equally to light, right subconjunctival hemorrhage. Head. Lacerated wound over right eyebrow connecting with circular fracture of frontal bone just above the orbital ridge. Mucous membranes of good color, tongue covered with bloody fluid (probably cerebrospinal fluid). Slight ecchymosis in eyelids, contusions over left knee. Laceration left eyebrow.

November 24, 9, spinal fluid puncture shows bloody fluid, no organisms on smears, but fluid slightly turbid. Blood pressure right arm 135 mm. left arm 125 mm.

Diagnosis of fracture of the skull was made and as confirmed by two X-ray plates by Dr. W. H. Stewart (Fig. 1). The patient, as prepared for immediate operation, but he cleared up so quickly that I decided to observe him for while. On the fourth day he is sitting up in bed on his seventh day he is out of bed on the eighth day he was sitting around, and as discharged December 5, the seventh day at his earnest request, against our advice and after signing release. One week later December he is readmitted to my service at the Harlem Hospital with the following history:

Three weeks ago he was struck by car and brought to this hospital, here he remained about week ago. Since his discharge he has had severe headaches and occasional vomiting attacks. He became dull and listless, few days after leaving the hospital, not taking any notice of his surroundings, etc. For the past few days he has not spoken when spoken to, although he understands, and he read the newspapers up until yesterday. There is laceration over right eye.

Physical examination. White male, adult 47 years old 5 feet 4 inches, 150 pounds, poorly developed and nourished, semiconscious and amorous, lying quietly in dorsal decubitus. Pupils of right upper lid. Tongue has

heavy brown coat tremulous. Throat negat. c. Heart sounds normal but somewhat distant, pericardium, within normal limits, no murmurs, no thrills. Arteries not palpable. Pulse regular in force and rate (66) compressible. Lungs. Prolonged respiration and increased breathless sounds over right base posteriorly no rales. Abdomen normal. Iliac. Upper border sixth rib in midclavicular line; lower border not felt. Spleen and kidneys not felt.

Skull lacerated over right supraorbital region; slightly infected. Depressed fracture of skull right frontal region other bones and joints show no signs of fractures. Muscles poorly developed and nourished. Lymph nodes, inguinal palpable. Abdominal not cremasteric reflexes no Babinski. Scars of organs, external, negat.

Mentally slow and at times is phasic, understands, but is slow but is not able to articulate follow directions. Writes unintelligently. When asked his name could or could not answer, then asked if he could write his name he nodded his head affirmatively. When given pencil and pad and directed to write his name he wrote the word "dangerous" irregularly and out of alignment. When asked "what dangerous" meant he looked at it and repeated "dangerous" a second time and then immediately wrote "dangerous".

Neurological examination by Dr. Wm. Levytsky. p. m. December 14. Patient is conscious and answers questions and obeys commands intelligently. Conversation slow inclined to lapse from time to time to condition of mental confusion no aphasia (was aphasic 1 a m.) no disturbance of speech no stereognosis. Tremor of tongue and hands. Pupils react equally normal. Subconjunctival hemorrhage in right eye. Local laceration and mobility of tongue normal. No tenderness on percussion over skull. N. rigidity of neck. Upper extremities normal, no rigidity or paralysis. Lower extremities show no paralysis or rigidity, but resistance to manipulation. Both knee jerks + right ++. Right extensor plantar (Babinski) response (inflexion). Occasional spontaneous dorsal flexion of great toe. Left normal.

Diagnosis. Increased intracranial pressure, probable abscess.

Blood count December 5, 9 2, shows a leucocytes, 5,000 number of cells counted no polymorphonuclear 80 per cent lymphocytes, 15 per cent large mononuclear 6 per cent small lymphocytes, per cent. Urine clear faintest trace of albumin, microscopically negative.

Ophthalmoscopic examination, December 5, by Dr. M. Cohen. External ocular examination normal, both eyes, slight subconjunctival hemorrhage in right temporal quadrant. Right fundus. Vessels enlarged and tortuous, central vein markedly dilated over disc and also at exit from nerve. Arteries slightly contracted. Disc borders indistinct due to marked edema. Left fundus. Vessels constricted in appearance with marked dilation (especially entrance). Arteries contracted. Disc borders indistinct due to marked edema and swelling. Suspicion of retinal hemorrhage. Unable to give a distinct location as patient is unable to fix eyes for any length of time.

Diagnosis. Bilateral optic neuritis indicative of intra-cranial pressure (etiological factor?).



Fig. 1. The arrows marked on plat indicate the location of the fractures: the outer vertical plate of the frontal sinus is driven directly back and, remaining against the inner plate. Careful examination will show linear fracture of the inner plate continuous with fracture of the orbital plate. Note no changes in the soft parts.

X-ray pictures (Figs. 2 and 3) December 4, by Dr. W. H. Stewart, show the ventricles enormously dilated. It is what was probably air or gas. Patient not having improved, but apparently getting worse, it was decided to do craniol decompression.

Operation December 6. Because of larger dilation of the right anterior horn, decided to do right subtemporal decompression operation and to tap the ventricles. An incision 3 inches long was made vertically curving slightly backwards over the temporal bone, through skin, fascia, muscle and pericranium. Pericranium elevated and 1/4 inch trephine opening made. The bone was very thin. The dura did not bulge and was not particularly tense. No fluid escaped on incision of dura or pia, and slight meningitis was noted. A needle was then passed into the anterior horn of the lateral ventricle and the removal of the trocar, as followed by two or three quick spits of air and fluid and then clear cerebrospinal fluid to the amount of 8 cc. The dura was then sutured with No. catgut; pericranium, muscle, fascia, and skin sutured. No drainage.

Because of the presence of slight meningitis, the large quantity of fluid, and the presence of air in the ventricles, we determined to drain them, thinking that the patient would surely get up an empyema if indeed he did not already have it. Accordingly the patient was now turned over on the table, face down, and suboccipital operation more or less along the lines suggested by Haynes was performed. An incision 4 inches long from just above the occiput to just below the level of the foramen magnum in the median line, was made through to the occipital bone, which was trephined and reorganized to the



Fig. 2. Lateral view. The arrows outline the dilated ventricles. The large round white shadow is the right anterior horn.

foramen magnum. The bone, as exceedingly thin. The dura, as focused and then the pia into the external sagittal, and immediately there escaped considerable clear fluid, generously saturated with bubbles of air. A small piece of twisted rubber tissue was inserted for drain. Fascia, muscle and skin sutured. Wound dressed.

The patient did remarkably well for four days after operation. December 7 the day after operation, temperature highest, 99.5; pulse 84, respiration 22. Patient conscious and perfectly rational but complained of some dizziness.

There was considerable discharge of clear fluid from the suboccipital drainage on the second and third days after operation. Blood pressure both arms 115 mm.

December 9, patient was in fair condition for the major part of the day. At 7 p. m. he suddenly took two for the worse; temperature shot up to 107; an enormous amount of fluid escaped into dressings from suboccipital wound. Patient died at 9 p. m.

Laboratory reports. Eight cubic centimeters of clear colorless, limpid fluid from tapping of anterior horn of right lateral ventricle. Benedict reaction for sugar (one hour) negative. Globulin reaction (Noguch's) negative. Smears from sediment show no organisms or leucocytosis. Cultures show no growth in 24 hours; no growth in 48 hours. Wassermann reaction positive.

Report of autopsy on E. K., performed by Dr. Otto Schultz at the Harlem Hospital, December 20, 1918. Body of slight build, adipose scant, weight about 140 pounds. Right side of forehead, extending from eyebrow upward and slightly outward, wound two inches long, partially healed, under which is found depressed fracture of outer wall of right frontal sinus, circular in contour about 1 cm. in diameter with its center depressed 1 cm. below level of margin. Inner wall of frontal sinus presents linear frac-

ture extending posteriorly through the right orbital plate and directed slightly inward.

Right temporal region, sutured wound of operation under which is found an oval opening of the skull directly over the course of the right middle meningeal artery also operative opening through the dura mater.

Linear sutured wound in median line from external occipital protuberance about 4 inches long with rubber tissue drain protruding from which light reddish thin fluid slowly drips. Opening in base of skull just above foramen magnum with drainage opening through dura and arachnoid into upper region of the cisterna magna.

Skull was opened for removal of the brain, the body lying upon chest and abdomen and the head hanging over the edge of the table. The posterior margin of foramen magnum and the arches of Atlas and Axis were removed with bone forceps. The entire area thus disclosed was found clean and absolutely free from blood clot beneath the dura mater and free from all evidence of pressure (no flattening of surface of brain) or compression of base of cerebellum upon foramen magnum.

The upper spinal cord and medulla were dissected out from below upwards, the spinal dura was cut from the anterior margin of the foramen magnum and the cerebral dura severed in the line of the saw-cut, and the tentorium cerebelli cut from its attachment to the temporal bones and clinoïd processes.

The skull-cap, containing the entire brain and stump of the spinal cord, was removed, the vessels and nerves being cut at the foramina of exit, from below forward.

The base of the right frontal lobe was found adherent to the dura over the fractured right orbital plate. These adhesions were carefully separated and disclosed a linear tear of the dura mater over the fracture of the right orbital plate, already described as communicating with the right side of the frontal sinus through the fracture in its posterior wall. The surface of the base of the right frontal lobe within the area of dissection showed a soft yellowish red laceration.

The skull-cap, containing the brain, was submerged in a vessel of water and on raising the stump of the spinal cord air bubbles emerged from the foramen of Magendie and when the extremities of the temporal horns of the lateral ventricles were incised, air bubbles emerged from them. The brain was removed from the skull-cap and bisected in the median plane. No blood was found in the ventricles.

The right half of the brain, with the lateral



Fig. 2. Antero-posterior view. Lateral ventricles distended with air. Small round white shadow just between and below is the third ventricle also distended with air. Arrow indicates the position.

ventricle empty and opening on its median surface, was placed in water with the median surface downward and on turning its base upward, air bubbles emerged through the laceration at the base of the frontal lobe, showing a communication with the anterior horn of the lateral ventricle.

The pia mater over both the frontal convolutions was opaque and light yellowish, with slight flattening of the convolutions extending on the right side to the anterior central, and on the left side to the fissure of Rolando, and a recent suppurative meningitis was present.

The inner surface of the dura mater over the vertex of the cerebrum and over the anterior and middle fossa of the skull presented an older hemorrhagic membrane, easily removable but without any free hemorrhage between the dura and the arachnoid.

Lungs Free from adhesions, distended, and emphysematous. Pulmonary artery enlarged in caliber with thin walls.

Heart Right auricle and ventricle distended with fluid blood. Left ventricle between systole and diastole. Valves normal. Muscle slightly brownish. Aorta shows moderate arterio-sclerosis.

Liver slightly fatty Kidneys slightly enlarged and congested. Spleen, gastro-intestinal tract, bladder and adrenals negative.

Diagnosis. Fracture of right frontal sinus and orbital plate with laceration of base of right frontal lobe adherent to dura mater subsequent necrosis and, through sudden increase of pressure of air in frontal sinus, a direct communication by rupture into the anterior horn of the right lateral ventricle. Recent suppurative meningitis over both frontal lobes. An older pachymeningitis haemorrhagica interna. Slight fatty infiltration of the liver. Chronic congestion of kidneys, and essential vascular emphysema.

One might well ask how and when this air got into the lateral ventricles, and why the enormous distention of the ventricles with air did not cause such an increase of intracranial pressure as instantly result in death.

We know that at the time the first radiograms were taken (and this is worthy of note) the air was not in the ventricles. We know that at the operation and at the autopsy evidence of great increase in the intracranial pressure was lacking. We had reached a reasonable conclusion that it was air within the ventricles and not gas, the product of a gas-forming bacillus, because of the sterility of the fluid from the ventricle tapping and the general absence of symptoms of any virulent infection. At the autopsy after seeing the fracture of the orbital plate and its connection with the fractured frontal sinuses, we surmised that while blowing his nose he had forced the entrance of air but we did not know however how to account for the absence of more positive evidence of intracranial pressure. This was cleared up by the following information imparted to Dr. Riley by a friend of the patient. Two days before the second admission to the hospital this friend called upon the patient and found him sitting down in a chair holding his head in his hands and groaning. The patient said to his friend, "I just sneezed and had a terrific pain in my head, and then a flow of a large amount of clear fluid came from my nose—about a cupful."

It has already been noted that the skull was exceedingly thin, so that when the blow was received over the right orbit there was a buckling upwards of the orbital plate which fractured

and injured the base of the brain just beneath the right anterior horn. A process of progressive softening took place around this point, and when he sneezed the air went up through the frontal sinus, that portion of it that surrounded the inner surface of the orbit, and forced its way through the orbital fracture and through the overlying adherent softened lacerated area of the base of the frontal lobe into the anterior horn of the right lateral ventricle. The air passed through the foramen of Munro into the third ventricle, through the corresponding foramen of Munro into the left lateral ventricle (antero-posterior pictures show both lateral ventricles distended with air) and through the third ventricle posteriorly into the *tertio ad quartum ventriculorum* (aqueduct of Sylvius) into the fourth ventricle and at the posterior angle of the roof out through the foramen of Magendie into the cisterna cerebelli medullaris (cisterna magna), where at the occipital operation we saw it bubbling up through the cerebrospinal fluid in the cistern.

The air was uppermost to the fluid in the anterior horns when we made the tapping in the right ventricle for the patient was lying on his back, face upward.

The air was uppermost in the fourth ventricle when we did the suboccipital decompression and opened the cisterna magna for the patient was lying face down with head hanging over the edge of the table. A valve-like closure of the soft parts surrounding the channel through which the air entered must have prevented its outward escape.

The sudden distention of the ventricles with air when the patient sneezed increased the intracranial pressure to the extent only that it forced out into the nose through the same opening in the bone through which the air entered, the cupful of fluid, probably cerebrospinal fluid.

This interchange of air from without for fluid from within evidently maintained the equilibrium of the intracranial pressure, thus the patient automatically decompressed himself and prevented his sudden death.

JUNTA-EPIPHYSEAL SPRAIN AND SPRAIN FRACTURE OF THE LOWER END OF THE RADIUS¹

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IN dealing with injuries at the wrist several cases have been met where the difficulty of diagnosis lay between junta-epiphyseal sprain and epiphyseal fracture in children or sprain fracture in adults, which could not be classed as true Colles fracture. Colles fracture is defined as one of the lower end of the radius due to falls on the outstretched hand, the line of fracture one inch or less from the wrist, transverse or oblique with a complicated displacement, and we get in the habit of calling nearly every fracture involving the radius near the wrist joint by that name.

Searching recent literature, especially the abstracts in X-ray work lead to an attempt to study the lower radial epiphyses from the standpoint of their manner of growth and closure looking toward light on the subject of these lower radial fractures and their mechanism and it is desired to show a series of skilagrams in this area. Roth in his book on the Roentgen Ray in Pediatrics, says no epiphyses have appeared in the lower radius at six months of age. The lower epiphysis is shown by skilagram beginning at two years and is well marked from that time on. It did not seem necessary to go back to such an early age as we are concerned with fracture, and individual skilagrams from seven years of age up would cover the course of these epiphyses for the present purpose.

Ligaments and tendons are inserted near the epiphysis of long bones and the strain of trauma on the wrist joint must be felt in the epiphyseal area for the most part. Treves says "Partial or incomplete fractures are valuable as showing real mechanics of fracture production; they tell where they began and the nature of the stresses."

The lower radial epiphysis is anatomically the most important, for there the greatest growth occurs, this epiphysis uniting last in the adult although the nutrient artery is directed toward the elbow. Hence its health should be guarded. If split or separated and not properly returned to its former position it may through subsequent trauma and strain on account of this unnatural position, become *locus minoris resistentie* and favor the establishment there of bacterial activity in those with latent infections in the general circulation.

Study of this series of selected normal indi-

viduals of both sexes demonstrates the growth and closure of the radius. This seems to occur as follows. About 11 years of age, the ulnar border of epiphysis begins to close, this slowly travels across toward the inner side of radius, lower epiphysis becomes thicker and larger; styloid process takes form about 14 years of age, grows steadily and at 19 years we find the epiphysis closed, inner side the last with styloid process still growing. After 20 or 21 the styloid assumes adult form. After seeing this epiphyseal development it is not hard to believe that the epiphyseal area, the last to become ossified and for that reason weaker in some respects, the area subject to the severe strains incidental to falls on the hand on account of the attachment of the strong ligaments of the wrist, should be the seat of cracks and fractures before other portions of the bone. As the hand is more often abducted and pronated the main stress in falls occurs on the internal ligaments, the ulnar border of the radius held firmly by the radio-ulnar ligament resists and the styloid process gives first as will be shown, the median edge of the epiphysis closing last, leaving a weaker spot here to favor this result. The pronator quadratus muscle acting above tends to pull over the upper part of the bone and approximate it to the ulna giving additional counterpull to the tearing out force of the internal lateral ligament.

In epiphyseal fracture exudation of blood occurs, between fragments not widely separated which exudation if followed by an infiltration of round cells and later organization might result in the obliteration of the growing function of the epiphysis and finally give a short bone as compared to its companion bone. Where epiphyseal fracture is undetected and the wrist is treated for a contusion, no splint used, the swelling is made greater, persists longer and gives some impairment of the growing function. Displacements relatively unimportant and not grossly apparent in a clinical sense, if uncorrected lead to an overgrowth of an edge of the bone tending to produce wrist deflection of the hand.

Corrected and given rest, such fractures of the epiphysis or lower margin of the styloid process hasten to bony union quicker than ordinary fractures as there is less displacement and if the epiphysis is involved its young bone cells become



Fig. 1a.



Fig. 2a.



Fig. 3a.

Fig. 1a. Sprain fracture radius with line running longitudinally up shaft. Deformity opposite that of usual Colles, lower fragment pulled down.

Fig. 2a. Skiagram of sprain fracture in osseous 5 years old. Illustrates the pulling out force of the lateral ligament on the radial side and the jerking transmission of the continued force through the carpal bones showing the finger edge of the radial articulation up onto the shaft of the

radius as collar. Ulna unharmed. No deformity on palmar surface of arm at wrist is nodine extending longitudinally, probably due to rupture of interosseous ligament. Point of extreme tenderness of radius where crack is shown. No swelling but much loss of function. No noticeable deformity. Fall on completely extended hand.

Fig. 3a. Sprain fracture running into joint

acutely active. We hardly appreciate the necessity of placing bony structures as much as possible in normal position. Wiring and plating are not done entirely to correct an overlapping which gives a troublesome shortening or deformity unpleasant to function or appearance, but unconsciously we replace muscles, tendons and joints in a position approaching normal and obtain in return not only correction of gross faults, but a greater degree of function and movement. As the capsular ligament of the wrist is continuous with the periosteum of the radius, juxta-epiphyseal sprain with tearing of these structures on both the dorsum or lateral surface offers as acute symptoms as epiphyseal or sprain fracture. In the case of sprain the swelling and effusion of serum and blood are deferred, simulating fracture, which is but a further action of an identical force, stopped short of separating the epiphysis or cracking the radius, controlled by the conditions governing its application or the toughness of the capsular structure.

If the capsule tears or gives way the bone does not break as rule, but as demonstrated by Ross and Stewart, the ligament is stronger than the bone or periosteum and in the majority of tests on the cadaver pulls out the bone surface, or causes by its line of stress a sprain fracture

across the impact-receiving area. Stimson believes that too much stress has been laid on the supposed rupture of the internal lateral ligament in sprains at the wrist for his experiments do not show this except in cases with marked displacement. Three causative mechanisms have been worked out:

1. Splitting or crushing, by force from carpal bones.
2. Radius yielding at weakest point by breaking up of the causative force.
3. Cross strain exerted at insertion of capsular ligaments especially on the anterior aspect with hand in dorsal hyperextension.

The last factor has never been given its full value. What in one case will give merely the sprain with ligamentous damage, in another will cause epiphyseal or sprain fracture of the styloid process with little displacement and no comminution. This cross strain force of which is received by the palm as hand is extended, is exerted just above the end of the bone by the anterior and lateral ligament. As the hand is bent back the ligament is put under extraordinary stress and the lower fragment is broken by being torn off. Stimson admits this can be done on the cadaver but believes there are few clinical cases. In the so-called chauffeur fracture like mechanism



Fig. 1b.



Fig. 2b.



Fig. 3b.

Fig. 1b. Excellent illustration of true sprain fracture, lower end of radius. Ulna unharmed, interosseous ligament not torn. Seen 4 days after accident. The opening of the crack can be made out on the articular surface of the radius.

Fig. 2b. Sprain fracture almost exactly across epiphyseal line.

Fig. 3b. Adult man. Sprain fracture both edges of radius at dist. Outer area above, the cracking and pulling force exerted by the straining ligament. Inner fragment more displaced. Ulna not damaged. Interosseous ligament undoubtedly torn. Complicated by fracture of scaphoid. Mechanism of fracture in this case due largely to transmitted force from carpal bones, as both edges of radius are cracked off.

caused by the sudden forcible back jerk of the crank handle puts this unexpected and powerful strain on the lower end of the radius when the ligament is tense with the exertion of cranking, resulting in transverse or diagonal fracture.

Taking first juxta-epiphyseal strain from a fall which gives but slight evidence in the skidgram of the pulling out strain caused by the trauma following through with more pronounced cases, first of sprain fracture involving a corner of the styloid process, then with more extensive injury cracking the bone nearly across the diameter of the lower end and finally getting an impaction of the two fragments after this cracking across, with little if any ulnar fork deformity or antero-posterior displacement, leads on to an ordinary Colles in accordance with the three methods of mechanism mentioned.

Recapitulated, the mechanism seems to follow in this order fall on hand pronated and probably abducted tearing stress of lateral and anterior ligament which is tougher than the bone to which it is attached tearing or splitting off of corners or whole diameter of the radius, continuation of force driving lower fragment up into shaft by transmission of line of force from wrist bones, and finally continuation by a breaking up of the lines of force as trauma ceases.

Fracture force in distinct fracture causes the bone to break frequently in the line of epiphysis and the lower fragment forced on by a continuation of the pressure is driven on up into the cancellous portion of the shaft, giving the impacted Colles. As the swelling and soreness are often not great at first and a superficial examination gives no crepitus, no false motion and little deformity which a sprain alone or a small hematoma might account for these cases do not come to the hands of the surgeon at once, or if they do are not diagnosed. The hand is used to a certain extent and it is only after the acute swelling has subsided and pain persists in the bone and function does not seem to progress as rapidly as the objective findings warrant, that the injured one seeks closer examination or a skidgram and the true condition is revealed. Too frequently weeks have passed in the meantime bony union has been inaugurated and on account of the proximity to the wrist joint one cannot exert sufficient force even under anesthesia to reduce the deformity and one hesitates to perform an open operation near the joint when one fragment is so narrow that plating is quite impossible. Such cases are best left alone, resulting ultimately in little loss of function, radial flexion of the hand and thickening of the radius with a humplike



Fig. 4 Epiphyseal separation in 9-year-old boy who fell out of swing. On radial side evidence of tearing out strain of ligamentous insertion

mass. In very few of these are the external lateral ligaments of the wrist severely injured or the styloid process of the ulna injured, the force causing the fracture evidently having been delivered sharply and along the radial axis in most part the hand being at the instant in slight abduction.

Juxta-epiphyseal sprain may be as painful and result in as prominent objective findings. Crepitus excepted, one cannot clearly differentiate if the acute swelling has occurred, as the hæmatoma formed by the tearing loose of the ligamentous attachments to the wrist, all of the epiphyseal area stimulates the fracture deformity. Where the epiphyseal area has been split across or the tip of the styloid process cracked with little displacement measurement of both radii from the condyle of the humerus to the tip of the styloid process may be equal or the injured side slightly longer. Local pain on pressure and loss of function are at first as great in sprain with ligamentous laceration and hæmorrhage as in true sprain fracture.

Skilograms are of the greatest aid under such circumstances for immediate knowledge, unless one wishes to wait a week for the swelling and pain of the sprain to subside to make a more positive diagnosis by manipulation. In certain class of cases this is unwise for obvious reasons. Examination with the fluoroscope is not satisfactory where the lesion is so delicate, and closer examination of the dried plate must be had.

Cotton says that separation of the lower radial

epiphysis is most common between 2 and 18 years of age, while Walton claims that epiphyseal separation is rare before 10 years and usually occurs about 17 or 18. Separation alone would most naturally happen in the younger children, caused by a fall from a height onto the extended hand and may result in splitting or comminution of the lower fragment, or this fragment may be merely started from its position. This happens, and without crepitus or a carefully studied skilgram the fracture is overlooked at the preliminary examination.

Other fractures seem to vary from this usual method—just why is difficult to state—probably on account of a decided difference in the method of receiving the trauma or different position of the hand at the time. After an accident causing such injuries it is not always possible to obtain a positive statement regarding the position of the hand but in short falls it is instinctively thrust the hand nearest the ground out to break the force, catching the weight on the palm or thenar eminence. The density of bones may vary enough to account for a green stick fracture or longitudinal fracture as reported by Parrish, the picture of whose case illustrates all, I believe the tearing out force of the ligamentous strain.

In some of these cases fracture of the carpal bones has been incidentally noted—whether they are true cases or not seems problematical. I would like to call to your attention in this connection a valuable work recently issued by Professor Thomas Dwight of Harvard Medical School, a clinical atlas of the variations of the bones of the hand and foot. He states, for instance that in a comparatively small number of adult hands the scaphoid is found completely divided into two or even three pieces, the line of division running obliquely from near the outer end of the articular surface of the radius to about the middle of the concavity for the head of the os magnum and that he feels positive that some cases of reported fracture of the scaphoid, skilgrams of which he has seen, are merely examples of this variation.

In children where there is no great separation of the epiphysis there is found no crushed cancellous bone and one would anticipate an early repair with the epiphysis retaining function but the result is problematical in every instance and cases of premature ossification or loss of growing function of the epiphysis have resulted. Andrews reported such a case in 1902. If this termination follows, the ulna proceeds in its normal rate of growth while the radius remains more

stationary and the deformity consists in a bowing inwards of the forearm, radial side shortened.

Ross and Stewart at the German Hospital in Philadelphia in going over records found that 15 per cent of all fractures confirmed by X ray were sprain fractures and that in 1910, 11 of these were of the lower end of the radius and that in 1911 there were 7 in the same location. They say "In order to have a luxation one or more of the strong ligaments must give way the ligaments do not give way themselves, but the bony tissue to which they are attached gives way — all luxations are permitted by primary occurrence of a sprain fracture."

As diagnostic signs the following are sufficient

- 1 History of sufficient trauma.
- 2 Small sharply localized area of swelling and acute tenderness over attachment of ligaments at lower end of radius (and ulna). The findings in sprain fracture under 2 are pronounced and certain recurring always at the same place when test is repeated so that one can in 80 per cent

of cases make a clinical diagnosis before skin gram.

Treatment should be that of fracture. Immobilization of wrist from base fingers to elbow in a light plaster splint hand in comfortable position generally slightly flexed, and forearm midway between pronation and supination. After 10 to 4 days, splint removed arm massaged, and after third week no support needed. This avoids prolonged disability from sprains, excess callus formation and gives better satisfaction to the patient.

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AN ALPARATUS—ANÆSTHETOMETER¹—FOR MEASURING AND MIXING ANÆSTHETIC AND OTHER VAPORS AND GASES

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- 2 General Considerations The desirability and achievement of accurate dosage
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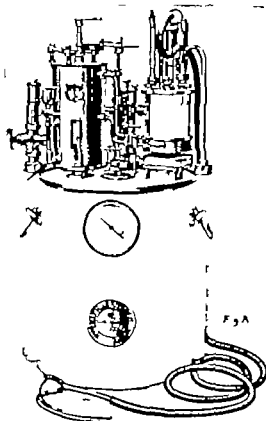
I FOREWORD

PRIMARILY the anæsthetometer (Fig. A) here described was designed to measure air and to volatilize therein any desired per cent by weight of ether secondarily to mix in measured proportion two or more gases, such as nitrous-oxide oxygen carbon-dioxide or al

The object of these procedures was to secure an even safe, efficient narcosis, believed to be attainable only by complete and continuing knowledge and control of the dosage.

The results achieved in the delivery of the measured dose by this instrument, particularly by intratracheal and intrapharyngeal insufflation, have been to increase the safety and efficiency of surgical narcotics, to decrease the shock of operation and the sequelae of ether anesthesia, and to afford precise data on which to base the dosage of an anæsthetic. In fact the most advantageous anesthesia can be plotted in advance for the type of individual and operative procedure and maintained after the preliminary stage entirely automatically.

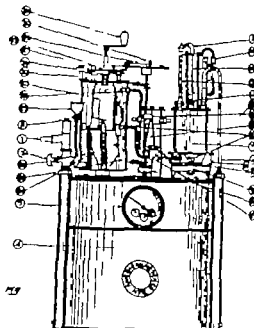
¹This word has been coined in the lack of an existing term, to designate an apparatus or instrument for the automatic measuring and mixing of vapors and gases used in anesthesia and for other purposes.



GENERAL CONSIDERATION

The necessity of exact dosage for drugs in the solid and liquid form has long been recognized. With volatile and gaseous drugs, dosage has remained inaccurate and largely a matter of individual physiological experimentation because of the lack of an automatic, precise measuring instrument.

The reasons, no doubt, for the present inaccuracy and lack of scientific data in handling this latter type of drugs, more particularly the anesthetic vapors and gases, has been the technical difficulty of measuring and delivering matter in such an elusive state as the gaseous. In fact in gauging an anesthetic given by inhalation, the patient has been used as the only available indicator of the amount and concentration of the drugs administered. It is true that the patient under light anesthesia is a fairly sensitive gauge, and it must be admitted that even in the stage of full narcosis when the patient ceases to be a sensitive gauge immediately serious results



are uncommon. No doubt this is due to the wide tolerance of man toward a toxic overdose of the more common anesthetics, and to the power of prompt elimination of volatile and gaseous matter held loosely in the blood. Yet obviously the use of the patient as a measuring gauge, and the varying personal capacities of the anesthetist as the measuring agent, are unscientific and undesirable and should if possible be replaced by accurate, physical measurements. Nor can the surgeon's duty to the anesthetized subject be fully performed without a complete and continual knowledge of the volume and dilution of the dose administered.

Efforts have been made to achieve mechanical accuracy in anesthetic mixtures by blowing air over or through a volatile anesthetic, or by dropping volatile anesthetics into the air stream. These procedures, while delivering more constant vapor than the skilled anesthetist can do, have made no fundamental advance. For in these efforts no accurate information has been secured as to the quantity and concentration of the vapor mixture delivered, and, in fact, the patient has remained the gauge by which the usual procedure must be adjusted.

It seems obvious, without further discourse, that the primary measurement of dosage, by physiological tests, should be superseded in the case of gaseous drugs, as it has long been with

solid drugs, by the administration of exact amounts, and that the invaluable physiological reaction should be reserved as a control and a court of final appeal.

Dosage defined. In the administration of a gaseous drug by pulmonary absorption exact dosage involves the maintenance in the gas—that is, air volume of the upper respiratory tract—of a known content by weight of this drug which by diffusion throughout the lung and absorption into the blood will induce and maintain a desired physiological effect. For ideal anesthesia this desired effect requires the constant maintenance in a sufficient tidal volume, of the lowest percentage of anesthetic which will hold a given individual safely and evenly anesthetized in a degree suitable for the surgical operation in hand. That this is possible by the use of the anæstheticometer will be presently shown. To what extent this ideal is approached by the traditional and usual methods depends on the experience and skill of the anesthetist. But particularly remote from the ideal is anesthesia in the average hospital, with its ever-shifting house staff leading sometimes to the immediate endangerment of the patient or to the discomfiture of the surgeon and even to those avoidable and sinister sequelæ which mar the records of too many hospitals. Yet, however expert the anesthetist may be, it remains true that exact determination of dose is to be achieved only by a physical measuring instrument, and that ideal dosage is to be realized only by first supplying in accurate per cent of dilution the entire volume per moment needed for respiration and second, by continuously placing this volume, in the patient where it will be the most effectually utilized.

Beyond question, intratracheal placement of the dose approaches most nearly to the ideal. Next to this, and far more easily achieved, is the insufflation deep in the pharynx. Crudest of all is that delivery by face mask which places the measured dose distal to the pharyngeal structures, now paralyzed, which may block respiration.

Apart from the immediate practical advantages to the individual which the introduction of an accurate measuring instrument affords, remoter benefits of scientific importance may be confidently anticipated. For presently exact data from different sources will be available so that surgical anesthesia instead of being maintained, as at present, according to personal reaction and the formulae of the individual anesthetist, may be on an established basis of exact measurement and dosage. The maintenance of anesthesia instead of being experimental with each individual

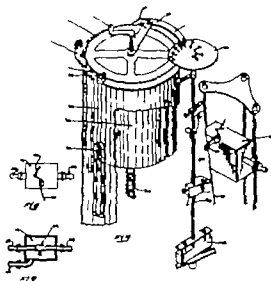
could be plotted in advance within narrow limits for the type of individual and the nature and stage of the operation.

By an instrument of accurate measurement already there has been accumulated data on about 400 cases at Roosevelt Hospital as to the exact percentage of ether by weight at sea level needed, in inhaled or insufflated air to maintain in the various types of humanity the various degrees of surgical anesthesia. Similar figures in regard to nitrous-oxide oxygen mixture are in process of accumulation. These will be merely touched upon in this paper and, with some previous data collected by a less accurate instrument, form the basis for a more complete communication.

The statements of accurate measurement herein deal only with the stage of actual anesthesia. It is obvious that through the stage preliminary to relaxation, ideal dosage by the respiratory tract is not feasible since through the preliminary stage of anesthesia only such concentration of the drug can be administered as the patient will inspire regardless of the scientific requirements. But definite dosage through this stage is a matter of secondary importance, the primary consideration being to abolish the active reflexes and saturate the blood to the stage of surgical anesthesia, by every art of the skilled anesthetist, with the minimal nervous and respiratory irritation. However when the pharyngeal reflex is abolished, and the laryngeal reflex much blunted, then the accurate administration, even of irritating vapors, becomes feasible. It is in this stage that it is particularly incumbent on the operator to administer a sufficient volume for respiration of a dilute vapor mixture bearing the lowest percentage of anesthetic possible for the type of patient and operative procedure.

Before describing the details of the anæstheticometer it seems wise to state that the apparatus as figured in its entirety in the appended diagram may appear to the non-mechanical mind very complex, yet each of the four units of which it is composed is of simple construction. Each unit fills a necessary function, for the most part automatically and there is little likelihood of derangement. In fact, the only complex part in the apparatus is the gas meter which has been reduced, through a century of development in the illuminating gas industry to the automatic marvel found in our own basement (frequently accused of falsifying). It is true, but rarely convicted of this, or of neglect of duty.

The actual operation of the apparatus is very



simple. Its control by the anesthetist centers in the movement of a single pin.

The instrument in its present form has been in continuous use at the Roosevelt Hospital for the past six months. It is an evolution from a year of experiment on the various mechanical mechanisms. The design for measurement as to quantity was based on the deductions drawn from several years' use of the Elsberg apparatus at the Roosevelt Hospital. More accurate data for the construction was gleaned from a use for six months of the writer's gas gauge vaporizer.

3. DESCRIPTION OF THE ANESTHETOMETER

General. The principle of the anesthetometer as an ether vaporizer is as follows: Air or other gas under pressure in passing through a gas meter actuates the usual recording mechanism. Simultaneously the same mechanism automatically feeds the proper amounts of ether into measured volumes of air to maintain an exact percentage by weight of ether to air.

This apparatus may be instantly adjusted to deliver any measurement, within the range of percentage by weight of ether vapor in air found to be useful in maintaining surgical anesthesia. The output remains constant at that known per cent. The volume of the vapor mixture is then adjusted as desired, to supply the entire tidal air.

The anesthetometer as designed for ether anesthesia consists of three assembled units, a gas meter (No. 4, Fig. 1) an ether reservoir (22

Fig. 1) and a vaporizing chamber (7, Fig. 1). For nitrous-oxide oxygen anesthesia a fourth unit is combined, namely gas oxygen trip-valve (8, Figs. 2, 3, 4). For a third gas, such as carbon-dioxide, a second trip-valve is combined.

Detail. The first unit, the gas meter (No. 4, Fig. 1) is an accurate, light, powerful meter of the dry meter type. It is a modification of that known in commerce as round, five-light, three displacement, dry, test meter. It is a high-grade measuring instrument, development of the past century in the flow-measuring gas industry. The metal parts are of brass and nickel and are accordingly indestructible. The leather diaphragms, such as exist in all dry gas meters, will stand some years of service and may be replaced at small cost. The reservoir is tested to two pounds pressure, and is capable of passing 30 liters of air per minute on differential of 5 mm. Hg. of pressure. It was adopted by the writer as the gas measuring and other motion mechanism after exhaustive consideration of the various types of wet and dry meters. It has dial (No. 5, Fig. 1) registering by large hand, two lines in fractions to each revolution, and smaller hands adding the total quantity. The same gear which drives the registering hand also drives mechanism which feeds ether into the vaporizing chamber (Fig. 1) (16, 20, 24, 26, 27, 28, 29). The ratio of this feeding mechanism can easily be shifted by replacing the pin of (29) on disc (20) so that any percentage by weight of liquid ether from 10 to 30 per cent may be added automatically to the air as it passes through the vaporizer. (For details of calculations see appendix A.)

The second unit of this instrument is an ether reservoir (22, Fig. 1), of 100 cc. capacity. This is a nickel cylinder with an outflow pipe at the middle (5, Fig. 1) and an air pressure equalizing pipe at the top (38) each connected to the vaporizing chamber.

The upper half of the reservoir is normally occupied by piston (3, Fig. 1) the lower half by liquid ether. The piston does not revolve, but is moved down and up by rotation of the central screw upon which it rides. When the piston descends, actuated by the central screw (24, Fig. 1) liquid ether is displaced, and flows through the overflow tube (5, Fig. 1) out of the reservoir into the vaporizer (7, Fig. 1). The rotation of the screw and descent of the piston is accomplished by the engagement of ratchet (26, 27, Fig. 1) governed in its motion by the revolving disc (20, Fig. 1) moved in turn by the gas meter. Thus one tooth up to sixteen teeth may be moved by the meter with each revolution depending upon the set of the pin on disc (20). The movement of one tooth displaces each weight of ether that this has added to the air passed by the meter in one revolution results in a mixture of 2.8 per cent by weight of ether vapor in air (See appendix A). The number of teeth moved with each revolution of the meter depends on the eccentricity of the hole on disc (20, Fig. 1). Such movement as has been found clinically useful is selected and the proper percentage stamped alongside the hole.

The reservoir holds 100 grams of ether or enough to last through long operations. The descent of the piston may be seen through glass window (28, Fig. 1) in the reservoir. When it reaches the bottom all the ether has been displaced.

To refill the tank the ratchet is thrown off by lever (33, 34, Fig. 1) so that the teeth are disengaged and the piston is again wound up by small crank (21, Fig. 1). Next the air and ether pipe to the vaporizer is closed by double, three-way valve (17, Fig. 1) and the ether reservoir is re-

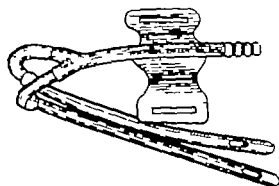


Fig. 5.

filled through funnel (5, Fig. 3). When fall level of pipe (5) the excess spills from spill-out valve (7).

The shaft connecting the ether feed to the meter mechanism has safety friction clutch (6, Fig. 3) which slips in case the ether reservoir is inadvertently allowed to become empty.

The third unit is the sporing chamber (7, Fig. 3). This is glass cylinder mounted on nickel cap (8, Fig. 3). Into this cap is definitely measured amount of ether is automatically poured through pipe (5, Fig. 3) simultaneously with the air which flows from the meter through pipe (6, Fig. 3). An accurate mixture results.

Heat, which is essential to vaporize with accuracy the higher per cents of ether is furnished by three-lock electric stove (9, Fig. 3) placed beneath the nickel cap. The heat of this stove is regulated by rheostat and distributed by water jacket (57, Fig. 3). The exact degree of heat, as will be seen in appendix note is unimportant. As routine the water is kept at about body temperature. If electricity be not obtainable, the jacket is filled as needed with hot water to maintain accurate vaporization of the ether. (Heat discussed, Appendix B.)

An absorptive disc of porous clay (32, Fig. 3) in the bottom of the cap holds liquid ether momentarily before its vaporization, equalizing any momentary inequalities in the delivery of liquid ether.

The vaporizer is surrounded by thermometer (2, Fig. 3) reading 1° to 30° C., and by U mercury gauge (30, Fig. 3) reading to 60 millimeters.

The vapor passes out through gas gauge (Fig. 3). This is light aluminum inverted cup, the cap of hollow sphere (14, Fig. 3) riding on float free on central rod in glass tube. It begins to ride on 8 litres (grams by weight) of air per minute and rides at increasing heights up to 30 litres (36 grams) of air per minute. The float, or loose piston, rises and falls with the respiratory movement of the patient. It drops instantly on any blockage of the air supply; as for example, kink in the supply tube. This floating gauge is very useful in pharyngeal and laryngeal intubation, as the operator may observe at glance about how much air or other gas by weight is being delivered at any given instant. The calibration in grams per minute is etched on the glass tube.

The fourth unit is added to extend the utility of the anaesthetometer to infusing trace gases.

This fourth unit added to the three already described consists of trip-valve (3, Figs. 3, 4, 5) tripped by the gas meter through any measured portion of its cycle. With this unit the meter may be run on two gases, nitrous oxide and oxygen for example, and deliver automatically with mechanical precision any measured percentage of

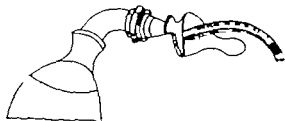


Fig. 6.

gases by volume to which the meter may be set. By the addition of second trip-valve, combining necessarily the arrangement of piping, third gas such as carbon-dioxide may be valued in exact percentage with two other gases. These may be added automatically exact amounts of ether. Thus, the meter may be set to, and it deliver automatically mixture by volume of any 5 per cent of carbon-dioxide, per cent oxygen, and 85 per cent nitrous oxide; and to this gas volume add if desired, per cent, of ether by weight 1/33 per cent of gas.

The working of this trip-valve is as follows. In flow ports (38, 39, Fig. 3) are connected, one to nitrous oxide or other gas under even pressure, the second to another gas, oxygen for example. An outflow port (43, Fig. 4) from the valve is connected by rubber tubing to the meter inflow (1, Fig. 3).

If the inflow port (39, Fig. 4) which is normally open, is connected with nitrous oxide then the meter begins to run on that gas. At certain stage of the revolution of the meter revolving surface or cam (19, Fig. 3) hits the alive spring (40, Fig. 3) and changes the motive gas flowing into the meter from nitrous oxide to oxygen. The meter then runs on oxygen until the raised surface has passed when the valve snaps back to nitrous oxide again. This cam is wedge section of cylinder against which the valve may be shifted so that the period of engagement may be from 1° up to 90° of the meter's cycle. The output of the meter can thus be adjusted according to scale on the cam from per cent up to 85 per cent of oxygen in nitrous oxide, and remains constantly at that volumetric percentage to which the valve is set. The valve is shifted by means of set screw and micrometer adjustment on its carriage.

The gases need be supplied under fairly constant pressure, such as is obtained in the operating room supply of modernly equipped hospitals. Under no more of gas pressure the output of the meter is litres per minute, sufficient for non-rebreathing gas-oxygen anaesthesia. For anaesthesia by intratracheal intubation the pressure of the supply is raised to 40 millimeters, which will deliver the necessary 8 to 24 litres per minute to the patient through the mechanical resistance of valves, meter and tubing.

Airline power. The most satisfactory source of air supply and that which should form the equipment of modern hospital, is compressed air from central plant, under about one pound pressure, properly washed and controlled. Air supplied to the meter may be compressed by common foot-bellows with slight exertion, but with some annoyance. A more convenient apparatus for routine is common small rotary electric air compressor such as many manufacturers supply.

Nitrous oxide and oxygen must be similarly supplied for mixture and administration. Used for rebreathing pressures of 5 millimeters suffice, but for intratracheal and pharyngeal delivery without rebreathing the pressure must be adjustable up to one pound. For those hospitals not equipped to manufacture these gases, permanent

Described in the International Hospital Record, November 1922.

Installation of reducing plant such as is installed at the Roosevelt Hospital for distillation of the large high pressure cylinders of commerce piping, address-cords and oxygen to the anaesthetist, will prove very satisfactory. Small portable apparatus costs as much, is more wasteful in leakage, less effective in reduction, is more cumbersome to the operating room, and utilizes gas more expensively compressed in small cylinders than does permanently installed capacious reduction plant.

4. USE OF THE INSTRUMENT

Details of etherization with the anaesthetometer. For ether vapor in air delivered by face mask methods, the volume is such as to supply the delivery bag with ample fresh vapor. This averages in the adult, without rebreathing, about 8 litres a minute. Beginning at 10 per cent, the strength of the ether vapor in the air delivered is increased gradually in the first two minutes to 26 per cent. By this time the patient is unconscious and in the stage of excitement. The percentages are now rapidly carried to about 38 per cent in the average case. By this dosage as by the traditional methods of etherization, the depth of anaesthesia is such as to permit within 6 or 8 minutes the undertaking of an operation, although full surgical anaesthesia is not established until about the tenth minute. As soon as relaxation begins the percentage of ether is lowered reaching 26 per cent the tenth minute and 21 per cent in another few minutes. The percentage is now gradually decreased until by the end of 30 or 40 minutes the 15 per cent line is reached. At this percentage full surgical anaesthesia is maintained for hours. Lower percentages result in light anaesthesia and in the gradual recovery of sensibility. All types of man run about the same curve in degree, varying only in the time and difficulty to arrive at a state of complete anaesthetic saturation. I. e., an anaesthetic tension point of all shapes of the body equivalent to 15 per cent of ether by weight at sea level in the alveolar air or a tension of 43 millimeters of mercury pressure. This saturation requires about five minutes in the least resistant babe up to 40 minutes in the most resistant robust alcoholic.

Delivery by insufflation is far more convenient and effective than by face mask. For ether vapor delivery by insufflation the following technique has been evolved from about 400 cases of intratracheal and 500 cases of intrapharyngeal insufflation through the past two years on the service of Dr. Charles H. Peck and Dr. Charles N. Dowd, at the Roosevelt Hospital.

For each method of delivery full preliminary anaesthesia is induced by usual face mask methods. When the patient becomes relaxed and the pha-

ryngeal reflex is abolished, the delivery tube is introduced.

For intratracheal delivery by the Meltzer method, the patient is intubated after the technique of Elberg, and is placed on a delivery of 21 per cent ether vapor in 18 litres of air per minute. In from three to five minutes, when the patient is completely relaxed and has ceased exaggerated and stertorous respiratory efforts and is sleeping quietly the percentage of ether is lowered to 19 per cent, in about twenty minutes more to 17 per cent, through the second half-hour to 15 or 14 per cent, and through the second hour to 12 or 10 per cent of ether in 18 litres of air per minute.

Alcoholics, muscular fat people, athletic boys from 14 to 26 and girls from 16 to 26, must occasionally be placed on 24 per cent ether for a few minutes and maintained on 21 per cent for 15 to 20 minutes to be held relaxed.

Operations involving pulling on the mesentery and biliary passages, within the first 45 minutes of anaesthesia, require 21 per cent ether vapor for a few minutes prior to and during such manipulation as may be attended by shock. This ensures control of respiration quiet anaesthesia, and the blocking of shock and muscular rigidity.

These percentages and volumes carry the average case automatically, under light, even, absolutely safe narcosis. The volume may be lessened for small individuals or during stages of light respiratory movement and the percentage lowered two or three per cent for unusually frail or susceptible individuals, and for mere plastic operations involving no nervous shock and where complete relaxation is unnecessary.

While intratracheal delivery of the anaesthetic by the Meltzer method is ideal in so far as control of anaesthesia and aeration goes, and is almost the mandatory method for intrathoracic surgery yet the existing inconveniences and delay of intubating the trachea will bar it for the present from general adoption as a routine method. On the other hand, pharyngeal delivery of the anaesthetic, as described by the writer has no such obstacle and being very efficient will undoubtedly become the method of choice as a routine, when the length of operation warrants the establishment of a scientifically maintained ether balance,

The number volume 18 litres as measured by the meter. This is the true bulk delivered for when other called at the meter, the air is measured and open mechanical when the gas volume released from compression at the delivery orifice and because further expanded by the absorption of body heat. The resultant volume from 21 per cent of ether by weight represented in 18 litres of air as usually delivered, is pressure-volume based at 17° C. 76 by liter, the density of ether vapor being .718. The ultimate volume based upon the percent, which disappeared to give rise, and based from 17° C. to body heat (including the addition of water vapor), is 21 litres per minute.

as for example in operations upward of ten minutes in duration. The following method, elaborated at the Roosevelt Hospital from the insufflation method of Junker and others, has most of the advantages of intratracheal delivery in quiet, efficient, automatic anesthesia and eliminates the inconvenience and possible dangers of intubating.

Pharyngeal reflex being first absolutely abolished by preliminary nitrous-oxide ether anesthesia, tubes are inserted through the nose and the lower pharynx is kept flooded with such a quantity of dilute ether vapor as to provide entirely the tidal air inspired.

The delivery is accomplished by two No. 18 F rubber catheters with double eyelet passed one through each nostril to a point behind the epiglottis. In case of nasal obstruction they are both passed through an unobstructed nostril or through the mouth. The tubes are attached to a curved metal Y the writer's nasal tube (Fig. 5) which fits the nose and forehead.

The average initial delivery instituted only after the patient has relaxed, is 31 per cent ether vapor in 18 litres of air making in total a volume of about 30 litres. More often than with intratracheal insufflation this percentage must be raised to 34 per cent, and for upper abdominal surgery in alcoholic subjects, even up to 36 per cent, since these cases as a rule breathe poorly and inspire only small volumes until they become fully relaxed. Usually within five minutes the percentage may be lowered to 19 per cent, and then to 17 per cent, and finally through the second half hour to 16 or 14 per cent, and to 12 or 10 per cent through the second hour.

As a guide to shifting the percentage, the reaction of the patient to manipulation at the operating field is the best physiological index. The ordinary signs of pupil, conjunctival reflex, etc. etc., are not disregarded. The patient is carried so evenly and lightly that a sudden increase of ether percentage should result in hesitancy of respiration or cough. Percentages below 14 are not useful through the first hour except for extremely light anesthesia or in unusually susceptible individuals. The physiological effect of percentages above 1 per cent must be watched. Between these two lies a safe it may even be stated non-lethal, fool-proof zone.

A preliminary report of pharyngeal insufflation as practiced by the writer with a less accurate instrument has been published.

Since the preparation of that report six months ago the present meter has been employed. Through the more accurate records made possible

by this instrument it has become evident that the dose delivered should in the average be as liberal in quantity and percentage as is set forth in this paper to yield in the hands of the average novice anesthetist a uniformly satisfactory result.

The quantity of ether consumed in a given time varies greatly with the method of delivery employed. It must be emphasized in this connection that the gross weight of ether consumed is not equivalent to or even an approximate index of the true dosage. I.e. the average percentage of ether which is being maintained in the upper respiratory tract. It is obvious that by employing closed methods and constant rebreathing, the actual intratracheal content of anesthetic may be high and the patient deeply narcotized with a very small consumption of liquid ether. On the other hand the ether content of the respired air bulk may be very low and as a result the patient insufficiently anesthetized with an enormous consumption of liquid ether because the vapor is too greatly diluted with air. For example, by careful administration and excessive rebreathing the amount of ether consumed in the first hour after the production of complete surgical relaxation may be kept below 60 grams, accomplishing a degree of anesthesia that cannot be maintained by ten times that amount of ether vaporized into air insufflated at an excessive rate, say at the rate of fifty litres a minute. No doubt proper middle ground exists.

It is the opinion of the writer that for ether anesthesia a wholly fresh supply of air should be made available for each inspiration. By face mask a wholly fresh delivery is not feasible, nor can the gas volume demanded by an act of inspiration be so completely satisfied by delivering the vapor mixture distal to the upper pharynx. By closed mask without rebreathing the average adult under full surgical anesthesia utilizes from 4 to 9 litres a minute depending upon four factors: first the usual respiratory capacity of that individual second, the degree to which the respiratory mechanism reacts to the stimulation of ether and of operative manipulation, third, as regards mobility of the chest, the position of the patient, whether cramped or free and fourth the completeness with which the anesthetist keeps the paralyzed and obstructed upper respiratory tract open.

For the methods of delivery which the writer prefers, i.e., intratracheal insufflation for special cases and intrapharyngeal delivery as a routine, the proper volume of insufflated air and anesthetic vapor is two and one half to three times

the tidal volume of that individual at any given period. As a basis 18 litres of air per minute may be indicated as a proper amount. To this ether is added increasing the gas bulk slightly (See footnote, page 250.)

The major part of this air as well as the ether which may be volatilized therein is wasted in so far as any physiological effect goes, being only of mechanical utility first, in increasing the force of expiration to blow mucus, blood and other foreign material from the upper respiratory tract second, in providing in total for the entire inspiratory volume without the undesirable occurrence of extraneous dilution.

Using 18 litres of air as a vehicle six grams of ether per minute are used during the first few minutes of surgical relaxation later in the first half-hour five grams, during the second half hour a little less than four grams and during the second hour somewhat less than three gram. This amounts in the average case without special endeavor to economize ether 160 grams in the first half-hour 115 grams in the second half hour 90 grams in the third half-hour and 60 grams in the fourth half-hour of continuous surgical relaxation. By nicely adjusting the volume and percentage to a given individual and to the steps of an operation, these gross weights of required ether can usually be cut by one third and occasionally by one half yet not with uniform success in unskilled hands. Occasionally in subjects resistant to ether intubation of the types previously noted, an amount as high as 320 grams has been required in the first hour of surgical anesthesia by intrapharyngeal delivery and by intratracheal a maximum of 390 grams has been employed. These amounts are exclusive of that used during the preliminary stage.

Ether percentages herein given are relative to air at sea level. At higher altitude while unlikely that more ether by weight or air by bulk, will be required yet the relative percentage of ether would be much increased. (See Appendix A.) To this ascending ratio the meter almost completely adjusts itself since the ratio of mixture in the vaporizer is by weight of ether into bulk of air.

5. THE USE OF THE ANESTHETOMETER IN NITROUS-OXIDE-OXYGEN ANESTHESIA

The technical delivery to the patient regards quantity percentage and mode of delivery of this anesthetic agent will be merely touched upon in this paper and taken up more fully subsequently.

The writer's experience in this form of anesthesia does not warrant more than these provisional statements.

First control over the volume and per cent of gases delivered and the intrapharyngeal method of delivery promises to place gas-oxygen anesthesia on the scientific and automatic basis on which automatic insufflation of ether vapor now rests.

Second preliminary narcosis by alkaloidal intoxicants may be dispensed with even in abdominal surgery if one is prepared to supplement the light anesthesia of nitrous-oxide by from 14 to 26 per cent of ether vapor intelligently introduced for a few minutes prior to each stage of the operation which may induce shock such as laceration through the skin the peritoneum the pericæum and traction on viscera. A much smaller percentage of ether vapor by continuous delivery will hold the average intra-abdominal operative case relaxed, as well as anesthetized.

Third, continuous delivery of about 8 litres per minute of mixed gases is the quantity generally useful. A less volume lowers oxygen so rapidly and unevenly by body absorption that no satisfactory automatic dosage can be attained, and the administration becomes entirely symptomatic as with the usual crude mixing apparatus.

Fourth, the mixed gas must of necessity be delivered by closed face inhaler until anesthesia is well established. Thereafter for a thoroughly controllable automatic delivery this must be made into the pharynx or trachea.

The following intrapharyngeal delivery has proven very satisfactory. As soon as the depth of anesthesia by face inhaler allows shift of delivery this is accomplished deep into the pharynx by double nasal tube as described for ether air mixture. Additionally however the nose and mouth must be plugged. The nose is plugged by slipping over each fork of the metal Y a small section of thick rubber tubing which fits a cork in each nostril. The mouth is plugged by the writer's rebreathing tube. This is a flattened copper tube (Fig 6) curved to fit the roof of the mouth. It has an adjustable rubber flange which fits between the lips and teeth, hermetically sealing the mouth and a common rubber gas bag attached to the distal end.

A delivery of 8 litres a minute is instituted. The bag is inflated by the expired gas to any desired degree of positive pressure the excess being allowed out from the distal end by stop cock. Rebreathing is utilized in this form of anesthesia and not in ether anesthesia because of the greater cost of anesthetic, and because of the stronger theoretical grounds for belief in the production of capnoea in this form of anesthetic. The anesthetic thus administered costs, for com-

mercural gas, two cents per minute. Economy to one cent can be made by decreasing the total quantity by half and by considerably increasing the percentage of oxygen.

The same remarkable picture can here be safely duplicated which in intrapharyngeal insufflation of large volume of mechanically delivered air ether vapor startles the uninitiated observer i.e., a patient sleeping automatically anesthetized with no anesthetist in proximity to the patient.

For delivery without rebreathing 12 litres a minute must be supplied for face mask and for intratracheal and intrapharyngeal insufflation, 18 to 24 litres per minute.

As a routine the initial bag of gas for the face mask is filled with pure nitrous-oxide, then connected with the meter on a 5 per cent oxygen delivery in a total bulk of 8 litres per minute. Gradually the oxygen per cent is increased to 12 per cent or even higher if the quantity delivered be small and the gas be rebreathed much.

A rapid change of per cent by the anaesthetic cannot be made, since the residual volume of the meter wherein the gases are mixed is about 5 litres. So that a direct supply tube of oxygen must be available when needed for emergency use and for the recovery stage. In practice, the supply tube to the meter is tapped as needed. However the necessity of any except gradual changes in oxygen per cent is almost eliminated by the reliable constant flow of known per cent and volume, provided the operator keeps the respiratory tract open, or delivers the anaesthetic into the pharynx.

Given a reliable supply of gases under sufficient working pressure, by the use of this instrument the following factors in the successful administration of this anaesthetic are put under the absolute control of the operator first, continual knowledge and control of the quantity and pressure of mixed gases being delivered second, automatic mixing to the absolute percentage desired of each gas by volume third, registration of the total volume of gases used fourth automatic addition of the percentage of ether desired.

6 THERAPEUTIC USES OTHER THAN FOR THE MAINTENANCE OF ANÆSTHESIA

Aside from use in anaesthesia the anaesthetometer is valuable to measure the air used for artificial respiration by intratracheal insufflation. Also to enrich the measured air volume with a known percentage of pure oxygen.

For artificial respiration in carbon-monoxide, morphine or other asphyxial poisoning and in

failure of respiration, about 18 litres of air per minute intratracheally insufflated is a clinically sufficient quantity. If respiratory movement is entirely suspended the nose and mouth are blocked about four times a minute for a few seconds at a time to expand the chest and more completely aerate the lungs, or else the delivery pressure is increased and the flow interrupted four to eight times a minute for a few seconds, which still keeps the quantitative delivery at a total of 18 litres.

The meter may also prove useful to measure the total carbon-dioxide administered for conditions of shock or to mix this gas in proper proportion with air or oxygen.

7 SUMMARY

The anaesthetometer is an apparatus for the automatic measuring and mixing of vapors and gases used to maintain anaesthesia and for other purposes.

The apparatus consists first of a gas meter as the measuring and motive mechanism combined with, second an ether reservoir from which volatile liquid is fed in accurately adjustable amounts into, third, a vaporizing chamber which is combined fourth with a trip-valve by which gases in any quantity may be mixed in accurate percentage.

By the use of this apparatus, that accuracy of dosage in the administration of gaseous drugs so long deemed necessary for liquids and solids is secured.

By the use of the anaesthetometer particularly in the intratracheal and intrapharyngeal delivery the dosage of gaseous anaesthetics becomes automatic, yet under the continuous observation and control of the operator. Thus efficiency and safety in prolonged anaesthesia are secured, and the shock and sequelae of ether anaesthesia are largely eliminated.

Finally it may be confidently expected that by the accumulation of accurate data such as this instrument makes possible anaesthesia by pulmonary absorption will be placed on such a scientific basis as accurate determination of dosage alone can secure.

The writer desires to express his obligation to Dr Horatio B. Wallace of the Department of Physiology College of Physicians and Surgeons, Columbia University New York, for much of the data for the solution of the problem in physics herein involved also to Dr Walter Boothby who has confirmed, in the Laboratory of Surgical Research at the Harvard Medical School the accuracy of the vapor percentage delivered and to Dr Charles H. Peck and Dr Charles N. Dowd, on whose services at the Roosevelt Hospital, New York the instrument and technique have been developed.

APPENDIX A.

Technical calculation. The percentage is calculated for this instrument for average conditions, remaining in the average correct to within one-fifth of one per cent, except for violent fluctuations from the average of barometric pressure or of temperature.

The standard instrument is calculated for sea level. A table of corrections is furnished for each 1,000 feet of elevation. The calculation is based on the following physical data, which is given to show the physical basis on which the instrument is constructed, and to render accessible the data for solvent corrections, which, while acceptable from practical standpoint, must be stated for scientific accuracy. The standard physical formulae by which these calculations are made are necessarily omitted from this paper for use of their length and complexity.

The meter passes four liters of air per revolution.

Dry 1 to 1 C. pressure 760 mm. Hg. right .303 g. grams per liter

However, the conditions under which the air is usually passed by the meter are these: temperature of the air 32° C. under 30 mm. of working pressure saturated with water vapor at 32° C. The altered weight per liter of air passed under these conditions is as follows:

A liter of dry air under 760 mm. pressure at 32° C. weighs .96 grams under pressure of 30 mm. right .47 grams saturated at 32° C. under 300 mm. the absorption of water being 10.63 mm. and the density of water vapor as compared to air 6.5, the weight of liter of air is .934 grams. Therefore the four liters of air passed under average conditions at each revolution of the meter weighs 4.056 grams.

Let us then let stream the meter can feed automatically into each four liters or 4.056 gms. of air from a maximum of 1 gram of ether up to a maximum of .94 gram of ether.

The amount of ether fed is calculated as follows:

The displacement piston (3) has an area of 38.5 square cm. The pitch of the thread on spindle (4) is .234 cm. per revolution. Therefore at each revolution of the ratchet wheel the piston descends 4.8 cubic cm. displacing 6 gms. of liquid ether (5) C. There are 96 teeth on the ratchet. The movement of one tooth on the ratchet wheel by one complete revolution of the air meter therefore displaces on the average .02 gms. of ether but 4.056 gms. of air yielding .9 per cent ether apor to air. The maximum movement of sixteen teeth yields 96 per cent ether apor. Thus all the ranges of percentage clinically needed for the maintenance of anesthesia is available in steps of about per cent.

Finer gradations could be made by use of finer teeth, but per cent is the smallest gradation that anesthetists are evident clinical effect on man as the subject of ether anesthesia, according to observation by the writer.

Errors of one tooth to one fifth of per cent are entailed by atmospheric changes of barometric pressure, temperature and humidity and by the latitude of error in the instrument itself but these are absolutely negligible from the practical standpoint. Only by the use of a meter and with great trouble in observation and by calculating every factor of error could percentage correct to more minute fraction be attained.

The meter automatically adjusts itself to higher relative percentage of ether probably required at high altitudes by feeding the same amount of liquid ether into the same bulk of air at lower altitudes. The resultant per cent mixture has only slightly decreased actual weight of ether per liter although the relative percentage of ether to air by weight is considerably higher than at sea level.

The percentage curve in surgical anesthesia for various types of individuals and operative procedures, plotted for ether anesthesia at sea level. It be treated to later communication together with the theoretical curve for higher altitudes.

APPENDIX B.

Utility of heat. In the application of ether heat is supplied, not to superheat the resultant apor but merely to spore the ether completely without depression of temperature, and about precipitation of moisture. The heat necessary for sporation of per cent of ether in 5 liters per minute of air under average conditions of delivery sea level is about 570 gram calories per minute for 4 per cent ether apor about 350 gram calories per minute. The ether as it is in contact with the vaporizer will not supply this heat. Only from adequate source of external heat, such as an electric stove or warm water bath can this heat be supplied. Without great depression of temperature under the sporation of ether and almost complete dehydration of the air used. The theoretical depression of temperature caused by sporing ether into air at room temperature, 15° C. in the absence of external heat, would carry resultant per cent ether mixture from plus C. down to 45° below zero. The practical significance of this is that the ether ceases to spore evenly and the air loses ninety per cent of the moisture contained.

The addition of heat to gas mixture for therapeutic purpose is futile for as has been repeatedly demonstrated, the specific heat of air is so low (0.17, 337) and also of 14 per cent ether apor (16.27) or even per cent ether apor (18.81) that the superheated gas almost immediately becomes room temperature. For example in passing 1 gram of air per minute (about 8 liters) to patient, the gas being superheated 10° C., flowing at the rate of 8 feet second through heavy insulating rubber tubing, then one quarter of one second the gas has lost practically all the superheat and has assumed room temperature. A gas depressed below room temperature will arm with equal rapidity.

Hence by addition of heat, available only to effect ether sporation with accuracy and almost dehydration of the mixture.

In regard to the attempt to deliver anesthetic mixtures also room or body temperature, it may be stated that such procedure is feasible only by having warming roll at the patient face and is of little practical utility. For the heat absorbed from the body to bring maximum unobstructed delivery of say 60 gms. (20 g. liters) of per cent ether apor mixture from room temperature of 22° C. to about body temperature at 30° C. is so slight as to be negligible (1 gram calories per minute of heat is absorbed). Vastly more important that the air be heated, at room temperature, for heat absorbed from the patient to bring 4 liters of dry ether apor mixture to 100 per cent of air saturation at body temperature is about 440 gram calories per minute or four times as great as that absorbed in warming the anesthetic mixture.

However attempts to deliver air or ether apor saturated with water at temperature above the room, as proposed in light with danger to the on the highest reduction of evaporative precipitation occurs in the delivery tubing, and liquid water is inhaled by the patient.

A calculation of the maximum heat loss by the body under conditions of maximum delivery is as follows: Granted that 25 gms. of per cent ether-air mixture saturated at 32° C. under 760 mm. of pressure is delivered and heated in the body on the average to 30° C. and excreted in the average 80 per cent of saturation

at 36°C . under 760 millimeters of pressure and expanded isothermally at that pressure, then the total heat absorbed by the gas in the anastomosis delivery is 42 calories per minute (about one-tenth of the total heat loss of the body). The major part of this, 36.4 calories, is in water vaporization.

The normal loss by the lung being .55 calories per minute in evaporation and 30 calories in heating inspired air it will be seen that the heat lost by copious insensate is about double that of normal. In theory this may sound large, yet when analyzed both in theory and from practical standpoint, it amounts to about as much as leaving the patient face exposed.

In view of the cumbersome apparatus that must be assembled to deliver vapor saturated with water at 36°C .

and of the danger of insufflating liquid water the results justified only the saturation of air at room temperature. The conservation in superheating the gas itself is so small as to be ridiculous.

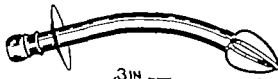
Conclusions. Important as superheat and moisture may be shown for small leaky animals, wherein the important source of heat loss is by pulmonary refrigeration, yet for man the practical results warrant no elaborate efforts to superheat, and to saturate with moisture at superheat, ether-air and other gas mixtures. Nor can the observation of alleged clinical advantage in delivering superheated vapor and gas mixtures find other than ridiculously small foundation in units of physical heat loss.

Heat is valuable, only to effect even vaporization of ether and water under conditions of room temperature.

A MODIFICATION OF SKENE'S RETENTION CATHETER

By JOSEPH RILUS EASTMAN M D FACS UROLOGIST

IN the accompanying cut is shown a modification of Skene's well-known catheter for continuous drainage of the female urinary bladder. The openings in the perforated olive bulb at the intravesical end of Skene's catheter are so small as to become readily plugged shutting off the flow of urine through the lumen of the instrument and allowing it to escape through the urethra around the catheter tube. The retention catheter shown here is quite like the ordinary Skene's catheter except that the perforated olive-bulb tip is displaced by four ribs which bow out in corn form. These ribs should be formed by splitting the end of the silver canula, thus making the ribs from the wall of the tube itself. If the ribs are of wire and



soldered or brazed on, the lumen of the catheter is likely to be encroached upon. The catheter thus made is quite easily introduced and may be withdrawn with gentle traction. Its only advantage over Skene's original instrument is that it offers greater protection against plugging. It should be constructed of silver. No doubt others have made similar modifications of Skene's retention catheter. It seems such a natural step to do so.

TRANSACTIONS OF SOCIETIES

CHICAGO SURGICAL SOCIETY

REGULAR MEETING HELD FEBRUARY 7 1913 WITH THE PRESIDENT
DR. CHARLES DAVISON IN THE CHAIR

DR. KELLOGG SPEED read a paper entitled
*Juxta Epiphyseal Sprain and Sprain Fracture
of the Lower End of the Radius.* (See page 941.)

DISCUSSION

DR. E. WYLLIS ANDREWS was asked to open the discussion. He said: The paper has interested me because I have had the opportunity of seeing most or all these cases during the time of treatment. Dr. Speed has been kind enough in his work at the Mercy Hospital to allow us to utilize a number of these cases in our clinic where he has patients from the New York Central Lines in our wards. We get a good many fractures of the wrist. I do not see how one can help but be impressed with this paper and the methods described. An hour of this sort with the actual skiagrams from actual cases is worth more than a whole treatise, such as one of those formidable books of Hamilton's, before the day of skiagrams. Now we get pictures of the actual bones and can trace the line of fracture in any given case. We do not have to generalize and theorize about the mechanics of the causation, nor whether the fracture is direct or indirect. We do not have to theorize about the mechanics of reduction and retention, nor whether the fracture is epiphyseal or not, or impacted or not. If we work it very much as we work on a skeleton, it is an actual mechanical proposition with the means of control at our command. We all realize that it puts the treatment of fractures on an entirely new plane. This report is a series of some value. Dr. Speed has taken the trouble to give us this graduated series year after year by ages showing exactly when the line of ossification is completed. It surprises me to find if this is a criterion, that such a large proportion of these so-called sprains are actual fractures. We have known of cases of fractures of the shoulder joint associated with rupture of the small fragments of the rim of the joint, and in the hip joint we find them in dislocations and fractures of the neck and acetabulum

tearing and stripping off segments of the bone by the ligaments. It is notably so in the wrist joint, and it is absolutely so in the ankle joint. There we seldom get such a thing as a dislocation of the tibia on the tarsus without associated bone injury. We have known for a good while, when we completed our examination by having to operate, the so-called sprains and dislocations are often associated with minute fractures. We did not know as well, before Dr. Speed showed this series of skiagrams, we could locate the tear of the bones. In the wrist cases it is difficult absolutely to differentiate between fracture and sprain or dislocation, so we will have to adopt a different terminology classification. We may use the term here. Dr. Speed has employed sprain-fracture or fracture-sprain. He has shown very definitely that very nearly every sprain will show a little bone tearing.

DR. D. B. PHARMISTER: The lesion, shown in the plate of the 5-year-old girl, in which there is a bulging outward of the radial cortex about one inch above the wrist joint on the ulnar side, is not one of sprain-fracture produced by pull upon the cortex by the radio-carpal ligaments, as they are inserted considerably below this point. This is a case of folding fracture or Stauchungs Bruch, as the Germans call it. It occurs between the ages of eight and seventeen while the cortex at this level is still flexible. When a not too severe force is received in the direction of the long axis of the radius, the cortex bulges outward in the same way as that of an iron rod where a portion has been heated. Where there is flexion combined the folding will be more marked on the side of the flexion, or present on this side only as in Dr. Speed's case.

DR. SPEED (closing the discussion): With reference to the remarks of Dr. Pharmister who stated that the pictures seemed to show periosteal callus along the inner margin of the radius, I will say that I have not found it in fresh cases, but it shows in the old cases which we get weeks or

months after the injury. For that reason, I firmly believe they are callus and not impaction, because all of these cases I have carefully measured and none has ever shown any shortening by the usual method of measurement. I want to say in connection with this sort of injury in the shoulder joint that it is rather common to find sprain fracture in the tuberosity of the humerus, where we get partial dislocations of the humerus from falls or injury to the shoulder joint and this is explained by the partial separation or pulling out of the tuberosity of the humerus by the *infra spinatus* muscle. This leads to what is frequently diagnosed as a subacromial bursitis, and most of the cases are not that at all. They are more or less sprain fractures, with the pain and tenderness due to the tearing out of the periosteal surface by the *infraspinatus* tendon. I have been taking pictures of all sprained shoulders I could find or rather dislocated shoulders, no matter at what age, and frequently find a faint shadow just above and to the outside of the tuberosity where the injury has occurred, and the surface of the bone has been pulled out and shows a shadow at that place even after several months or years.

DR. DANIEL N. EISENDRATH read a paper entitled *Diagnosis and Treatment of Bilateral Urinary Calculi*. (See page 218.)

DISCUSSION

DR. L. L. McARTHUR: Dr. Eisenrath requested me to make some remarks on this subject, because we have had in common a number of cases in our service at the Michael Reese Hospital of this type, and one in particular the picture of which he has presented.

There are two or three points that I think are well worth discussion. The opinion of the various men who have had experience in this line of work I should like very much to hear. One is the question of calculous anuria, the other the question of whether reflex anuria may occur. I will first relate an experience which has occurred during the past month that leads me to an absolute conviction that a reflex anuria may occur.

A young boy, age 10, with multiple foci of tuberculosis along the genito-urinary tract, who has been under my care and that of Dr. Favill and Dr. Gregory for five years, and who, after having two of these foci that were suppurating removed (these being in the epididymis of both sides) still had a tubercular bladder tuberculosis of the prostate tuberculosis of the subprostatic glands, tuberculosis of the vasa deferentia and tuberculosis of the testicles. The suppurating foci having been removed, he was then given tuberculin

at that time weighing only 115 pounds. In the course of nine or ten months, after cleaning up the suppurating foci and giving him tuberculin, he came up to 150 pounds. During the past summer he was apparently in perfect health although still showing purulent urine tubercle bacilli in the urine, but enabled to play 36 holes at golf to eat three square meals a day to play tennis, symptomatically well. Six weeks ago he experienced a sudden left renal colic, intense in character which because of its severity and the scantiness of the urine which appeared, sent him to the hospital for X-ray pictures of the entire urinary tracts of both sides, but no stones were shown. Stones not appearing he was treated expectantly for two or three days. He then had relief from his pain. But his elevation of temperature continued, a left tender kidney was enlarged, and the urine was reduced about one half in quantity from what it had been. His hectic lasted for three weeks, the temperature being 101 in the morning, and 103½ in the afternoon. I took him back to the hospital for the purpose of removing a tubercular kidney which I refused to remove five years before because of so many tubercular foci. The left kidney was removed, and its ureter found extremely enlarged—sufficiently to introduce the finger. The kidney was a markedly distended hydronephrosis tuberculous. I therefore felt quite sure that the opposite kidney could do the work, because I thought the ureter after all the handling I had made was obliterated, and that the other kidney had been doing the work for three weeks. After the removal of the kidney the patient passed for the first 24 hours, once 1 ounce the next time 10 ounces, the next time 4 ounces of urine. I felt surely safe. After that he passed no urine for five days in spite of all efforts to make him do so. He then, after being put in a hot Russian bath apparatus, passed half an ounce. Three days later he passed after a hot bath in a tub wound and all being in the hot water an ounce and a half of urine. He then passed no water until the 11th day when he passed urine and blood, half an ounce at a time four or five times in one morning. After that he never passed urine and on the fourteenth day became uremic to the extent that he had hiccough and he was somewhat confused. He never became cyanosed. He never became febrile. His pulse stood between 80 and 90 and temperature 98.6. He died without having pain on the opposite side after having passed a full quantity of urine during the first 24 hours, and without colic on the opposite side so that I felt justified in figuring it was a reflex anuria and not

a calculous anuria, the X ray picture not showing at any time any calculus on that side, although it had been taken a number of times in five years by Dr. Case. Here, I believe, is an instance in which we have an absolute reflex anuria, and it may occur with a calculous condition on one side and it may not always be possible to determine it. A calculous anuria may occur also without colic, as has been evidenced by the case I once presented before the Society of a cystinuria, and in that case the X ray picture failed to show a shadow and will always fail to show a shadow because cystin is a fatty body which fails to cast a shadow. I opened through the pelvis of that kidney because the calculus I had removed from the opposite kidney had shown it was cystin, and believing that a shower of cystin crystals had come down in the other kidney. I opened the other pelvis and saved that patient, the ureter later being washed out and crystals of cystin having plugged the ureter. We cannot, then, always depend upon our X-ray to help us out on the anuria which may occur.

A second point worthy of comment and caution is the question of prediction of a recurrence. The prediction of recurrence can be made in those cases of calculus removed from the kidney that are of an extremely soft phosphatic type, and even with the most delicate handling have fragments break off from them.

There succumbed to my surgical intervention at Michael Reese Hospital two months ago a man from whom I removed a calculus a year before of such a type. It was so soft and friable that I was sure I had not gotten all of it. It crumbled in such fine crumbles that I put a large tube in the kidney to keep it open for a long time. I had put on the record the probability of this man's having a recurrence of that stone because of these fine fragments which might remain in some one of the calices of the kidney and cause a recurrence. True enough, in a year he came back with the recommendation that that kidney should be removed if recurrence took place. I removed the kidney but he being septic at the time of its removal failed to improve and finally died with chronic sepsis a month and half after the operation.

I believe, too, that the contour of the calices of the kidney in the cases of multiple calculus enables us to make a prediction of probable recurrence.

There is considerable difficulty in deciding which kidney to select to operate upon, but with Watson, whom Dr. Elsdenrath has quoted, I think the one which is causing the most pro-

nounced symptoms is the one which should be selected for removal. It is not always possible to catheterize the ureters, even when you call in an expert to assist you in that, or to do it for you. You are not able to collect the urine from the ureters; you are absolutely at sea as to which kidney is the one that functionally is the more capable—that, I think, in spite of our indigo-carmin and other dyes or the sugar test. The only scientifically accurate test of the functional capacity of the kidney in my opinion is that which has been devised by laboratory experiments, namely that for practically all mammals a given amount of kidney substance secretes in a given time so much urea to the kilogram of body weight, and that the urea taken as an index in a patient who has an ordinary normal diet will be the best guide—that is, the functional capacity which Harris presented to the society in connection with his segregator—and it has been shown that as long as an individual has enough kidney substance to secrete eighteen kilograms per minute per kilogram of body weight, there is enough kidney substance to maintain life. That is a minimum. It is often much larger. That, too, is a scientific basis on which to make it, whereas the excretion of the dyes or the crystallization of a urine that may be simply concentrated from small amounts of water or diluted from a large amount of water by fluoroscopy is not nearly as accurate a basis.

The case that Dr. Elsdenrath has referred to and presented pictures of that has been under my care is that of a young girl who had a left renal colic first, and who, having the stones demonstrated with the X-ray had them removed, although the right kidney showed stones that were causing no trouble. She remained well for nine months or a year and then had right renal colic so severe that the stone from that kidney was removed. After a year lapse of time the urine never clearing up completely she came back with left renal colic, both kidneys showing stones in them for which a third operation of emptying the kidney was done. I heard from her to-day indirectly through her family physician, Dr. Sachs, that she was quite comfortable, that she had some uneasiness in the right side. He desired to know whether it would be injudicious for her to take laughing gas to have tooth pulled that was ulcerated, because of her renal condition.

Dr. A. J. O'Connor. There is no doubt in my mind but what there is sympathetic anuria, because I have had personal observation of that condition in several cases in which there was positive evidence.

The suggestion made by Dr. Elsendorath with regard to the wisdom of having both sides skia-graphed is a good one. There is no doubt that many of these cases have renal calculi produced on both sides, and in my own experience there have been many cases in which the calculi have passed spontaneously from both kidneys, and I have operated on several cases upon both kidneys for the removal of calculi.

I have spoken many times regarding the last conclusion which Dr. Elsendorath made which refers to the recurrence of calculi, but I do not know whether I have spoken of it in this society.

Some twenty years ago Harrison of London demonstrated the fact that calculi formed only in case the urine had a certain density and this density cannot be reached if a patient regularly takes a sufficient amount of distilled water. In that way it is possible in these cases to prevent recurrence of calculi, provided the patient is sufficiently impressed with the importance of this fact so that he understands it clearly. I have had the opportunity of demonstrating that in a large number of cases. One case which illustrates this was a colleague of mine who could be free from calculi provided he drank distilled water, but if he got careless and failed to drink undistilled water the calculi would return. The last attack he had was in 890. Twenty three years ago I kept him asleep a whole day with chloroform, off and on letting him wake up occasionally and when the attack became severe I would let him go to sleep again. Since that time he has drunk distilled water and has had no attacks, although before that he had recurrences for twenty years.

Another case I had that demonstrated the value of distilled water was one that had renal colic every three or four months for several years until about eight years ago when I put him on distilled water.

For six or seven years he never had an attack until two years ago. During the summer he was building a house, and thought it was too much trouble to drink distilled water and before the summer was over he had another attack. This patient lived in northern Wisconsin. He came to see me during the attack and by giving him two ounces of glycerine in a pint of distilled water several times, at intervals of twenty-four hours, and half a pint of distilled water every half-hour he passed a calculus. Since that time he has had no other attack, although formerly by drinking ordinary water he would have an attack every three or

four months. At the same time it is important to prevent the urine from being alkaline in reaction.

I have had a number of these cases. The fact remains that if a patient with renal calculi will drink enough distilled water to keep the specific gravity of the urine below 1015 he will not have a recurrence.

DR. EISENDRATH (closing the discussion) Dr. McArthur brought up the point of recurrence of calculi which I did not mention in my paper. These cases of phosphatic calculi are apt to be the ones which recur.

I have been much interested in this whole subject of calculous formation because there are certain analogies which it bears to calculous formation in the gall-bladder. In the urinary tract we have one factor which plays a larger rôle than it does in the gall-bladder. In the gall-bladder calculous formation is favored by the precipitation of salts by stagnation. That is not necessary in the urinary tract. There seems to be two factors in the urinary tract and elsewhere. I do not doubt the experience of Dr. Ochsner but it does not seem to cover every point. We have discussed the question of the use of distilled water before in these cases. In the first place there is the question of infection. In the second place there are disturbances of metabolism which we do not know about. It is possible of course, by giving large quantities of distilled water to so dilute the blood as not to favor the precipitation of these urinary salts, but I hardly see how it can play any rôle in such cases as the one I reported of bilateral calculi and also such a case as Dr. McArthur has reported. There it is impossible to get rid of the colon bacillus infection which involves the whole urinary tract. Both kidneys are infected, and unless we can get rid of the infection there is going to be a relation between the precipitation and salts.

The key to the recurrence of calculi depends (1) upon whether we can control the disturbances of metabolism, and (2) whether we can control infection. Unless we can do both of these things we must expect recurrence in unilateral and bilateral cases. We must prepare these patients. When I operate on a patient for calculus I tell him that I am going to take out the calculus, but I cannot guarantee but what the same conditions will recur that I cannot guarantee but what in some instances a calculus or calculi will re-form. It is well to-day in doing kidney surgery more and more to leave a loophole for the future.

CHICAGO GYNFCOLOGICAL SOCIETY

REGULAR MEETING HELD FEBRUARY 1, 1913 WITH THE PRESIDENT
DR. RUDOLPH W. HOLMES IN THE CHAIR

DR. CHAS. B. REED reported *Six Cases of Pubiotomy*. Mrs. Z. first came into my service in 1907. She reported that her first labor had lasted six days and was then terminated by forceps. The child was large and dead.

Her second pregnancy was now near its end. Her pelvis measured Sp. 20 cm., Cr. 24 cm. Ext. Conj. 17.5 cm. Troch. 29 cm. Conj. Diag. 10 cm. C. V. (est.) 8.85 cm. She went into labor on June 7th and entered Wesley Hospital. After 12 hours of ineffective pains she was prepared for Cesarean Section. Save that the placenta was attached to the anterior uterine wall the operation was uneventful and the patient was delivered of a 7-pound boy. Head measured Bitemp. 7 cm. Bipar. 8 cm. It is probable that this child might have been delivered by version. The Conj. Vera measured directly during the operation was found to be 8 cm. The pelvic bones were unusually large and thick. The convalescence was marked by considerable tympanites.

In 1910 she reappeared with a third pregnancy and refused section. Labor was therefore induced by the metrecrystol at the 36th week. Pains began at once and the 9 cm. bag was expelled in 3½ hours. The cord followed it out so the cervix was slightly incised and version done.

Extraction by Smellie Velt followed. Woman in Walcher position and the head forced down into the pelvis from above by an assistant. After considerable difficulty the maneuver succeeded. Babe was a girl, which revived slowly and lived. Weight, 5½ lbs. Head measured Bitemp. 6.5 cm. Bipar. 8 cm. Subocc. Br. 9 cm.

In August 1912 patient reappeared with a fourth pregnancy. She steadily refused section and in view of the last experience a pubiotomy was decided upon. Labor began Jan. 25, 1913 and after 14 hours the patient was removed to the clinic. To be sure of complete dilatation the hand was carried into the os and the fist clinched. It was enough. The pubiotomy needle was introduced on the left side brought out well to the left of the labia majora. The bones were severed and fell apart so that two fingers could rest between the ends. The usually free hemorrhage was readily controlled by compression.

An easy version and extraction followed.

The babe was a male lived, and weighed 6¼ lbs. Head measured Bitemp. 8 cm., Bipar. 1 cm. Subocc. Br. 10 cm. Occ.-front. 11 cm. The patient walked on the 14th day and left the hospital on the 21st with a slight limp.

This is my sixth case.

One of the others had an equally interesting history. The first and fifth pregnancies were terminated by craniotomy of the living child, the second third and seventh by abortion. The fourth by induction of premature labor at the thirty-seventh week. This child died during delivery.

In the sixth a prophylactic version was done at term and the child died during extraction. She came into my service with her eighth pregnancy in June 1910.

She was 36 years of age. The pelvis was flat and measured Sp. 21 cm., Cr. 25 cm., Ext. Conj. 18 cm. Diag. Conj. 9.9 cm. Pubiotomy was done after she had been in labor 12 hours.

The child was a male weighed 8 pounds, and the head measured Bitemp. 6 cm., Bipar. 10 cm., Subocc. Br. 10 cm.

In this small series of six cases one was a primipara and five multiparae. In all cases the operation was simple in performance unaccompanied by complications, and satisfactory in result. In no case was hemorrhage excessive or difficult to stop.

The convalescence in one instance was four weeks. In the others three. In one case the labor had lasted two days and the operation was done to avoid craniotomy on a living but seriously exhausted child which died during the extraction. This was the only death either of mother or child.

In all cases the Cr. varied from 8 cm. to 9.5 cm. In four cases the bones healed with the end some distance apart and in one of these cases the patient gave birth to the next child spontaneously.

My experience with the operation so far has been distinctly favorable.

PLEGOMANIA ALBA DOLENS

Dr. HANSEAT M. SZOZ. I wish to report briefly an interesting case of acute plegomania alba dolens. The patient, a young woman of strong build, twenty-eight years of age, who was delivered normally at 4½ months by physicians. There were two maternal examinations made

without gloves and slight tear of the perineum as found. There was no post-partum hemorrhage. Fifty hours after labor she complained of high fever, rapid pulse, and severe pains in the right leg. She came to the hospital and upon her admission she had temperature of 101.5, pulse 140, leucocyte count of 30,000 and complained of severe headache. Examination of the abdomen showed absolutely nothing. She had not urinated. She had no chills. The abdomen was lax, and was without pain, though the uterus as tender on pressure. The broad ligaments were absolutely negative. The right leg was swollen and quite edematous, reddened, glistening, and several superficial veins could be made out which were tender on pressure, hard, and felt like cord. Deep pressure over the femoral vein in the inguinal region also elicited severe pain. A smear of the lochia showed a large number of hemolytic streptococci. Her pulse went up from 120 to 150 which could not count it. The fever rose from 103 to 104 at the time of death, which occurred forty hours later.

Dr. E. Wyllis Andrews in my absence kindly incised the leg in several places and found a number of superficial and deep veins which were clotted and distended, and bacteriological examination of these clots also showed hemolytic streptococci. After death partial autopsy was allowed, and uterus was found to be absolutely negative, and the broad ligaments free, and there was no peritonitis. Nothing as found in the abdomen or the body excepting this condition of the right leg. All the veins of the right leg were filled with this blood clot which extended up to Pott's ligament, and several of these veins which are examined were full of streptococci.

As phlegmasia alba dolens is a slow infection coming on two or three weeks after labor we do not expect to find such a condition as was found here. As a general rule, the infection spreads by contiguity of tissue, with involvement of the uterine wall and broad ligaments and pelvic fascia and thigh. In other words, it extends like carcinoma, but this case shows that it can also extend in a manner similar to sarcoma. That it can extend into other distant portions of the body and not by contiguity is of great interest.

This is a very brief history of the case. There are very few cases of this kind reported in the literature. In an autopsy made at Vienna some three or four years ago on a case of the same character it was found that the entire veins of the left leg had been thrombosed and filled with these streptococci. Evidently the infection is very virulent in these cases, but in the majority of them the infection is of a mild character and the patient generally recovers.

Dr. BACOV: What was the object in opening the leg?

Dr. STOWE: The idea was that there was pus, but no pus was found.

Dr. RUDOLPH W. HOLMES: If I may take the liberty I would like to report a case which is rather rare, and yet it is not so unique as Dr. Stowe's case.

About five years ago I had young woman, primipara, who cut her labor. She got into the expulsive stage when the head was beginning to distend the perineum. Suddenly there was a gush of blood from the rectum. Within a few moments the baby was born without difficulty but the perineal skin was absolutely intact. Looking from without, as unfortunately too ordinarily is done, one would say she had absolutely no tear of the perineum, but on opening and inspecting and palpating we discovered there was nothing left but perineal skin. In other words, there was complete laceration of the skin of the perineum with perforation of the rectum.

Last evening I had another woman who was exceedingly muscular, about 6 feet and one inch tall, weighing 80 to 100 pounds, starting in the morning at 3 o'clock with labor pains. The pains did not become active until late in the afternoon of that day. The membranes were ruptured at 7:30 and things are going along beautifully. She as suffering so slightly that it is not thought necessary to give her an anesthetic. The head of the child became visible and the perineum began to be distended, and I noticed little hair coming from the rectum. With the next pain that area of scalp and hair was more evident until it was about the size of half dollar. It having been distended to that extent. Realizing that she would be to have an operation, and that we could save time by operating promptly she was anesthetized, and I cut through from the posterior commissure to the rectum with scissors, and the baby weighing 9 pounds and ounces, fell out. That variety of tear is really very unique.

One thing with regard to the treatment. It is absolutely indispensable — in fact, it is impossible to make an attempt to repair such a condition unless there is complete severance of the skin making it an ordinary complete third degree laceration. If there is an attempt to approximate the perineal body the skin is going to well out and you will have pockets in which blood will accumulate and infection will follow and the integrity of the perineal body will be impaired. With that variety of tear we are impressed with the necessity of converting it into a third degree tear and proceeding along the ordinary lines.

Dr. CHARLES E. PADDOCK: In connection with your case, Dr. Holmes, I will report one and I would like to ask a question. You say we must make a third degree tear. I would like to ask a question if I am permitted to do so. How far back would you go in making this third degree tear?

Within the past 10 months a case has occurred in my own practice in an old primipara, thirty 8 years of age, with very hard contractions coming on at intervals of at least 10 minutes, every two or three hours, and the question arose of an impending rupture of the uterus. It seems to me, with the hard pains there might be such a thing as an impending rupture of the uterus. I gave her an anesthetic as used to certain extent, but it seemed to have very little effect unless we put the woman completely under its influence. As soon as the first stage of labor was over the pains continued as bearing down pains, and after while the case terminated without any tear of the perineum.

Upon examination later, back of the cervix, I found hole in the rectum. Do I understand that we must, in order to repair this tear according to your statement make the incision back far enough to repair the tear, which has extended back to the cervix and into the rectum? In this case I did not do that, but I made an opening, repaired it through the vagina, and the result was excellent. These operations must depend upon how far back they are from the perineal body.

DR. RUDOLPH W. HOLMES: In these two cases there was a complete tear of the perineal body with perforation into the rectum without rupture to the skin. Your case Dr. Paddock was something entirely different. It undoubtedly was a tear or rather cut, through the recto-vaginal wall. This was a complete laceration of the perineum perforating into the rectum at the anal fold leaving the skin intact. In that case it is different from a tear high up in the vagina. A vaginal tear does not need any interference with the perineum but such a complete tear as this or where you have a very deep tear as sometimes will happen, will involve the perineal body. In both of my cases, looking at the perineum you would say there was no laceration whatever and yet there was that destruction of the perineal body.

DR. A. S. HEANEY: Your instructions are in such extreme cases a this, when everything is torn except the skin and the skin remains, to cut it?

DR. HOLMES: Yes, cut the skin open.

DR. HEANEY: If the sphincter is intact unless you have a tear from the vagina into the rectum, you do not cut it?

DR. HOLMES: If it goes down half way you will have a pocket. This circle (indicating on blackboard) is the skin that if brought together in our case it is not cut. Here (the line of repair of the perineum). It is hard to bring this skin so that you have absolutely a T-shape. There is going to be a pocket here because I go across you include skin as you go on the other side and the difficulty of that is, when the blood is always present and swelling up, you cannot see. I have had two failures from not cutting down where I had extensive loss of the integrity of the perineal body. With the skin intact.

ABDOMINAL PREGNANCY

DR. WILLIAM N. THOMPSON: This case is one of abdominal pregnancy. A woman thirty-six years of age. I was her first pregnancy and she had no unusual symptoms until well along toward the latter part of her term. Then she said she felt something go away. After that she felt no motion and experienced severe cramps, and some brownish shape and passed clots of considerable size. I saw her three weeks after that time and made diagnosis of abdomi-

nal pregnancy. Let me endeavor to check up my diagnosis. I had an X-ray picture taken which showed nothing except an ill-defined tumor. There were no pains. The reason, I think, was that the fetus had been dead two weeks and the bones had begun to degenerate, and also it was well down in the hollow of the sacrum and could not be seen or was overshadowed by the thick bones of the sacrum and symphysis. The woman was operated on, and of course we expected some sepsis. We made the ordinary operation for such cases and drained through the vagina. The patient made good recovery.

DR. PADDOCK: You say it was an abdominal pregnancy?

DR. THOMPSON: I should have said the fetus was in the pelvis. The placenta was divided between the open tube which was spread open a considerable size and a part of the placenta was spread over the rectum or adherent to the rectum. It could be stripped off. It was disintegrating.

DR. PADDOCK: It was tubal pregnancy.

DR. THOMPSON: Yes but at this time it became an abdominal pregnancy.

DR. HOLMES: Could you get the sac out?

DR. THOMPSON: Yes, I could peel it out.

DR. ROBERT T. GILLMORE: With reference to the question of the X-ray in the diagnosis of cases of this kind it is quite essential that one should have the facilities for having the best kind of X-ray apparatus also, a very fine radiographer. I have had the experience of trying to have an X-ray made by a man whom I supposed to be competent, and it was diagnosed as a tumor by the radiographer. We were instructed to go ahead and operate and about two weeks later I delivered the woman of an eight-pound boy. However I have seen some very fine X-rays made of these cases where the bone formation was not perfect and I have seen shadows at from four to six months and they were fine showing the position of the child only the work was done by a man who had had considerable experience and he had one of the finest X-ray outfits that could be had. We cannot depend upon the diagnosis with the X-ray unless we are sure of having the finest X-ray apparatus we can have and a competent radiographer and one capable of developing these light shadows.

DR. CHARLES E. PADDOCK: I want to emphasize what Dr. Gillmore has said in regard to the character of men who make these diagnoses with the X-ray. Within the past year I have had such a case of pseudocystitis, and a diagnosis was made of pregnancy. The patient was waiting then in the hospital to be delivered. Careful examination under an anesthetic revealed nothing in the abdomen but to be sure they were correct an X-ray picture was taken. The X-ray man, according to his decision

showed me the head of the child. He said he could see it, but I could not, and the woman has not been delivered yet — and it is about a year

Dr. CHARLES B REED I would like to ask Dr. Thompson, in reference to this case, whether the child lived after its discharge into the abdominal cavity?

Dr. THOMPSON The woman said after that she felt no motion.

Dr. REED It was a tubal abortion?

Dr. THOMPSON Yes. It was considered to be a tumor by the X-ray man but I was quite sure it was easy to feel the foetal head in the vagina.

Dr. CHANNING W BARRETT In this connection I would like to read briefly the history of a case. The patient is now in the University Hospital.

Mrs. B., aged 36 married sixteen years, has had two children, one fifteen years ago, and one about thirteen years ago. She supposed she had miscarriages about six or eight years ago, other than that she was absolutely normal in menstruation. She was regular in June, July, August, and September. She menstruated first at the age of thirteen, and her menses were painless. She menstruated October 20th, or October 21st. The flow was slight and without pain. She flowed for day or two, and then it stopped. It came on again and kept returning in that way without pain, as little dribble of flow until about December 20th. She had nausea and some vomiting, but had been rather given to that sort of a thing for a number of years. She also had some tenderness of the breasts. She concluded she was pregnant. She consulted

a doctor who found the uterus somewhat enlarged, but thickening outside of the uterus. Monday before New Year she passed clot with some tissue. The nurse found no lumps with that. She flowed once more, and then ceased to flow. At the time of passing the clot she had rather marked pain in the right hip, but other than that she suffered no pain during the flow. I was called soon after that and found mass outside of the uterus, but did not think from the character of the mass and the absence of pain she had an extra-uterine pregnancy. I saw her again about February 15th and made diagnosis of extra-uterine pregnancy continuing term, or the fetus continuing to live. That diagnosis was based upon the fact that the flow from the uterus had entirely stopped, and the mass kept on increasing without pain in the abdomen. We operated February 5th and found pregnancy continuing. There was no free blood in the abdomen. The ovum was pushed back, the appendix tipped down into the pelvis posterior to this, and the rectum as very much crowded by the mass. The tube as very much enlarged at the outer end. The placenta as still attached largely to the end of the tube and in the end of the tube. Reaching down posteriorly the membranes were all that separated it from the posterior wall of the pelvis and the rectum. That as usual broken. An oval mass as largely in the peritoneal cavity but the placenta was still attached to the tube. It was tubal pregnancy with hardly complete rupture of the tube. It was more of an abortion, and the tube ruptured. After lifting out the lumps, mass nearly as large as one's fist appeared below that, and upon lifting that out it broke off from the posterior layer of the ligament. It was detached of the ovary. That is

I took it to be that without cutting it open. I recall in this connection specimen that was exhibited as an abscess from the ovary but when it was cut open it was found to be a dermoid, and this may be the opposite of that. However I take it to be dermoid. The appendix was very much enlarged, and about six inches long, and

then removed there was about the same length of the fœtal membranes attached to the appendix. This fetus was still alive and the heart continued to beat 5 minutes after its removal. It was only about four-month fetus. It was not as large as the one Dr. Thompson has shown. This patient is making good recovery. I think case we drained close to the inguinal region.

Dr. ROBERT T GILLMORE In regard to the nomenclature of tubal abortion and tubal rupture, I am inclined to think that Dr. Reed's conception of tubal abortion and tubal rupture is a little confused. Tubal abortion is where it comes from the fimbriated extremity of the tube, and wherever there is rupture of the tube in such a slight manner it is a tubal rupture, and tubal abortion is only possible in the early months of pregnancy — in other words, when it can go through the fimbriated opening of the tube — and after about three months it is an impossibility and then you usually get a rupture.

Dr. MARK T GOLDSTEIN I would like to ask why these cases were drained? They were clean cases to start with.

Dr. THOMPSON I felt it was better to be on the safe side, and so I drained in my case. There was a leukocytosis of 20,000, and there was considerable of an abscess discharged from the vagina about a week afterward. The temperature was elevated at the time I operated.

Dr. CHANNING W BARRETT I drained my case in order that the patient might live. After removing a pregnancy which has continued to that extent, there is certainly always a good deal of abraded and oozing surfaces, and there would be an accumulation of blood in the abdomen if drainage was not resorted to. That would almost be inevitable. I would rather have the blood outside than inside the abdomen. The vessels were tied. The drainage that took place afterwards showed there was quite considerable fluid in the abdomen.

Dr. REED Was there anything but blood in the abdomen?

Dr. BARRETT I do not think there would be any feces or pus.

Dr. REED Would you drain for blood?

Dr. BARRETT Yes, if there was a considerable amount of it.

Dr. A. BELCHAM KEEVES We have a right to speak of internal rupture of the tube where that portion of the tube which contains the fetus ruptures into the lumen of the tube and the blood

purses out of the fimbriated extremity and perhaps towards the uterus. It is termed internal rupture with or without escape at the fimbriated extremity of the fœtus with or without abortion. External rupture is where it penetrates straight through the tubal wall and peritoneum into the peritoneal cavity and thirdly we may have a combination of these. As I understand this was a ruptured tubal pregnancy with tubal abortion and secondary adhesions in the abdominal cavity. Had this rupture gone through the wall, we know that when we open these cases we find nothing running up to the fimbriated extremity. In rare instances the fimbriated end may be closed by adhesions and a rupture through the tube wall into the peritoneal cavity is called an external rupture.

Dr. WILLIAM M. THOMPSON read a paper entitled "Influence of the Thyroid Gland on Pregnancy and Lactation." (See page 276)

DISCUSSION

Dr. GEORGE F. DICK was a led to open the discussion. He said I have not done any work on the thyroid, but this paper has been exceedingly interesting to me in connection with some work that I and my associate did on the function of the corpus luteum and particularly the case he mentioned where pregnancy terminated and there was apparent absorption of the embryo about the fourth month. There was an idea advanced by Frankel that the corpus luteum was necessary for the continuance of pregnancy up to about the first half and our work was a confirmation of that. This case Dr. Thompson reports is of interest as it indicates that there may be a mutual intercompensation that is, where there was a deficiency of thyroid function it would result in the same way as if there was deficient function of the corpus luteum.

I think the remainder of the paper particularly the case reports, is particularly interesting to anyone who is interested in experimental work, because such work is hard to produce experimentally. Rabbits were worked on by us in which the ovaries were removed and he was unable to show any change in the thyroid, but such changes are hard to demonstrate.

Dr. N. SPENCER HAZEN. I was much interested in Dr. Thompson's paper the more so since recently peculiar changes in the liver resembling those found in eclampsia, have been described as occurring after the removal of the parathyroids in animals. In experimental work on the thyroid in dogs it is impossible to eliminate the rôle of the parathyroids since one cannot attempt a

complete thyroidectomy without injuring the parathyroids. In those dogs of Dr. Thompson's which showed tremors and convulsions the parathyroids must have been severely damaged though left *in situ* since those dogs had tetany, which is a parathyroid trouble. As a matter of fact there is much reason to suppose that more depends upon the integrity of the parathyroids in pregnancy than upon the thyroid gland itself.

Dr. CHARLES S. BACON: I appreciate the experimental work that Dr. Thompson has done and also his review of the literature, which is valuable and I think it is unnecessary to compliment him further than to say that such work is always appreciated. But I want to make one criticism. He has reported a case of interruption of pregnancy apparently a retrogression of the pregnancy that had advanced, if I remember rightly three or four months after the removal of one of the lobes of the thyroid, and in such a way as to give the impression that that was due to this operation. That is a most astonishing fact, if it is a fact and if that is the right explanation I think it is of so much importance that it should have been reported with greater attention to detail. We should have been given positive evidence that pregnancy did exist. We should have been given evidence that the pregnancy was disturbed in that way. I do not know that there has ever been a case like that reported in the human subject. If so they are rare.

Dr. CHANNING W. BARRETT: There are few clinical points I would like to bring out in this connection in relation to the interesting subject of the thyroid connected with pregnancy. Bearing upon the case which Dr. Bacon comments on, I will say that during the last year I operated on the West Side upon a case of hyperthyroidism during pregnancy. The patient had the right lobe, which proved to be a double lobe, enlarged very rapidly during pregnancy. It had caused hyperthyroidism, so that there was great rapidity of the heart-action which had not yielded to the treatment of the doctor who had her under observation. The thyroid gland reached considerable size, so that it was compressing the trachea considerably and the patient was having difficulty with respiration. The two lobes were removed. The patient continued to term without any difficulty. There was no evidence that abortion was threatening or anything of that kind, nor while the patient was yet in the hospital, although she was in the hospital in a little less than six weeks, with the pulse quieted down considerably.

In relation to enlargement of the thyroid with

a gynecological condition of the tube, I was called to see a case of hyperthyroidism with a retro-displacement and adhesions of tubes and ovaries. The thyroid gland was considerably enlarged but not sufficiently so to compress the trachea. The condition of the thyroid gland rapidly subsided after the correction of the pelvic condition. We see these cases subside so frequently under other conditions that this may not have any great weight.

Another patient who had an enormously enlarged thyroid developed some symptoms of hyperthyroidism during pregnancy but these were not very marked and she continued to term without any interference. That woman gave a history that her mother also had an enormously enlarged thyroid gland. Her grandmother saw the child which when born showed considerable enlargement of the thyroid gland, so that it embarrassed the respiration of the child considerably yet in seeing the child a number of months later the thyroid gland had gone down to nearly normal size and gave no trouble.

DR. GEORGE SCHMAUCK. I am glad to see that there are many other members interested in Dr. Thompson's paper. I have formed my own opinion about the thyroid. A great deal of misunderstanding comes, as I think, from the fact that so many physicians do not understand hyperthyroidism. The thyroid itself is nothing more than any other gland or organ, and if you connect hyperthyroidism with hyperactivity of this gland it is natural that such an organ can only be sufficiently active for a certain span of time.

Like Dr. Bacon, I think Dr. Thompson's case is extremely interesting. It is one of the few cases reported in that line where pregnancy has been interrupted by operation on the thyroid. But I have come to the opposite conclusion, which is that the thyroid is absolutely necessary to keep up healthy pregnancy and the health of the child. The same conclusion I would come to with regard to the experiments on dogs. In a number of these dogs where he left a part of the thyroid, this part must have been extremely active; otherwise the dogs would have aborted. The thyroid was so elastic that it could make up the loss and go on functioning although the demand on this gland is greatly increased during pregnancy. In regard to the relation between thyroid and menstruation, I also differ somewhat from Dr. Thompson. The thyroid brings on and keeps up menstruation; menstruation is impossible without the thyroid.

The conclusions we come to, regarding the

thyroid are based on clinical experience by feeding thyroid extract. In a real case of hyperthyroidism you will make the patient worse by feeding her thyroid. Insufficiency in the later stages, however, shows the same symptoms as activity of the gland we find the same tremor, the same palpitation of the heart, and the same emotion. In most cases of hyperthyroidism, we do not deal with primary hyperthyroidism; it is a secondary hyperthyroidism brought on by faulty metabolism or bacterial toxins. These are the patients that get well by feeding thyroids, although they have all symptoms of hyperthyroidism.

The reason why gynecologists have not taken up this subject more thoroughly is because it became the domain of surgeons, though most of these patients are women. The reports we get from surgeons are not as reliable and complete as they might be. They never tell about myxedema, amenorrhea, and such conditions that follow extirpation of a part of the thyroid gland years afterwards. French authors have drawn attention to a fact I have observed myself that in many cases pregnancy is able to cure asthma, to cure chronic rheumatism, and many other ailments by the hyperactivity of the thyroid. This proves not only the increased secretion of the thyroid during pregnancy but also its powerful influence on the general metabolism. Secretion in the thyroid is merely a functional phenomenon. This glandular function depends on climate, nourishment, and central influences. The plain logic demands an insufficiency following sooner or later the surgical diminution of the thyroid.

DR. MARK T. GOLDSTEIN. Just a word or two about the thyroid gland in dogs. I do not see how you can make a comparison between the human subject and a bitch who gives birth to puppies time and again. A female dog that has enlarged thyroid glands, even very marked enlargement, may live for many years and never show any symptoms of it. Such an animal will give birth to puppies probably as frequently if a thoroughbred, as an ordinary dog will. The only influence that the enlarged gland seems to have on the puppies is that they are not as good dogs as you probably get from a female dog who did not have an enlarged thyroid. We had a dog in Chicago, the finest female dog ever bred in this country. Her grandfather was Major McKinley owned by General Thomas, on the North Side. I watched her for ten years. She had seven litters of puppies and all through these she had an immense thyroid. We never got a

good puppy out of that dog. We got about 40 or 42. There was another dog, Old Denbigh, who took the first prize for setters. She took first prizes at most of the bench shows. This animal was bred to the finest Gordon setters that could be got and supposed to give the finest dogs. She had three litters of puppies, but we never got a good puppy from her. They were bow-legged and knock-kneed and cross-eyed. The colors were not right. She had exophthalmic goiter. Before she died she had marked exophthalmia, she had tremor, etc. This is the only female dog I have watched—and I have watched many of them with enlargement of the thyroid—that ever died a death that was at all typical of exophthalmic goiter. I could enumerate other cases in the same way. The enlarged thyroid in male dogs does not have any effect whatever or at least it does not seem to. I have one dog which has an immense thyroid for his age and so far the animal has not shown any symptoms. Whether the influence of the enlarged thyroid on the puppies I believe they have a mighty poor sell on which I grow or not I cannot say. But patient with enlarged thyroid are mighty sick patients. You will get so many of them if you examine them carefully. As to dilated heart, you get that sometimes in the female dogs. You get a much larger heart than usual.

As regard operating on the thyroid gland it is a bad operation on any dog. If you operate on a male dog and remove a part of the thyroid or most of it the dog usually dies. It is the same on the female dog. I have been interested in watching high-grade female dogs for many years, and I have yet to see a female who has puppies that come up to expectations. I have a friend on the North Side who has dogs we are watching. A high-bred brindle bull bitch with a large thyroid who is going to have puppies very soon. The sister of this animal died of dystocia. She had a thyroid quite large and could not throw her puppies; she died when it came to birth. What will happen to this one we do not know. But if she has the high-grade puppies as she ought to have from the breeding it will be a surprise.

Dr. A. SPROAT HERRICK, Prof. Carlson of the University of Chicago, has made observations corroborating those just now related by Dr. Goldstone. He further observed that when the mother's goiter was of such a nature that the thyroid activity was deficient the pups were uniformly goitrous but that normal puppies were born when the goiter caused no thyroid insuffi-

ciency. He thought that this might be explained upon the basis of a compensation—that the pups' thyroids hypertrophied to supply the deficiency of the necessary thyroid substances in the mother. He feels that he has proved this hypothesis experimentally by removing portions of the gland of pregnant bitches and securing puppies with hypertrophied thyroid glands.

Dr. GEORGE SCHMIDT, I am familiar with the literature on this subject, and so far as I know there is only one case reported of Basedow's disease in a dog. That experiment has been made dozens and dozens of times, and no one has been able to bring on real exophthalmus connected with hyperthyroidism. All these dogs the doctor told us about are insufficient and I venture to say that if he will feed his dogs with bone they will raise nice puppies without any inefficiency at all.

Dr. RUDOLPH W. HOLMES. In regard to the case reported by Dr. Thompson of partial enlargement of the thyroid and diminution in the size of the uterus I will say that a year ago I had a patient whose case was of considerable interest.

A woman came to me in December. She had been married six or seven years, and had never menstruated since marriage. The uterus was characteristically distended, enlarged, and she was beginning to miscarry. She had one or two attacks of emesis, the breasts were enlarged, the areolæ were discolored, and we got colorless. I followed her along the next month and thought she was about three weeks pregnant. I followed her along the next month and I thought she was about four or five weeks pregnant; the uterus becoming symmetrical. She had the characteristic signs of pregnancy continuing, and when it came to the next period she said she passed few drops of blood. I examined the uterus and thought it was about the size of ten weeks pregnant. She came back again and had no spotting of blood, and I examined her to see whether she was pregnant or not. The uterus had subsided and the coloration ceased. She is now four months pregnant, it being her second pregnancy. Whether she ever had signs of any secretion or whether something happened to the corpus luteum about the fourth month she produced this retrogression, I do not know.

About three months ago another case came to me. She had been under the care of one of our experts on tuberculosis for the treatment of suspected tuberculosis. She had been married about three years. She came to me in the sixth month of pregnancy. She had missed six periods. I examined her and found she had made mistake. She was only about three months pregnant. The next month she came to me. There was no enlargement of the uterus. She had slight characteristic symptoms of pregnancy. In the course of about six weeks, the breasts were enlarged and tender, the areolæ were discolored and there was colorless. I told her she made mistake of three months, and I commented to the increase that even if the uterus had not increased in size there was something wrong. There was probably the death of the embryo. She came home at the second week, then she was about seven months pregnant, and two or three days later she passed a little blood. She came back and attended in the

hospital about six. There was intermittent bleeding, not very profuse, but still it was persisting, and the uterus was smaller, and then she began to have little colic and I thought the best thing was to empty the uterus. There was no mass of necrotic placental tissue found. The membranes were not found and unfortunately perhaps could not have found anything anyway. The debris was so necrotic that I threw it away. She did not have anything wrong with her thyroid, and I thought possibly that it was a coincidence, as it was in Dr. Thompson's case that there was this retraction.

Dr. THOMPSON (closing) I appreciate the indefiniteness of the experiments I have related to you. I referred the theme to a pathologist who told me whether I had parathyroid or thyroid tissue. I found it so very difficult to deal with the parathyroids in rabbits that I turned to dogs. It is easy enough to locate the right and left lobes of the thyroids, but the isthmus is such a delicate structure I could not get all of it. Beneath it I did not get all the parathyroids in the cases related, but I concluded that I had damaged the tissue so thoroughly that it ceased functioning.

I was very much interested in the remarks of Dr. Dick and I am sorry he did not go into the subject more explicitly.

Dr. Heaney speaks of the difficulty of this operation and I coincide with him in regard to it. After considerable practice in handling dogs and examining them we get a little different technique from what is ordinarily employed in the operating room, i. e., using the skin in the median line, and

with the finger dissecting the muscles and feeling the thyroid. Where it is hypertrophied it is easy enough. The thyroid varies more in dogs than I had any idea of.

With reference to the remarks made by Dr. Bacon about pregnancy being interrupted, I should have been more careful in my statement and it may be a coincidence. It happened at that time. The woman had all the evidences of pregnancy. She had an enlarged and softened uterus, she had the areola discolored, she had the line in the center of the abdomen and had nausea. I delivered this woman of a future pregnancy, the child being healthy, so I was able to watch the remaining thyroid, which hypertrophied immensely at the next pregnancy.

Dr. SCHMAUCH Did she have any children before that?

Dr. THOMPSON No. I agree with Dr. Schmauch in regard to the thyroid influencing menstruation. I have collected a good many reports on the influence of the thyroid on menstruation, but it was not possible to include them in a paper of this character. There is no doubt about it. We do not appreciate the slight variations in the function of the thyroid in pregnancy and in diseases of the pelvic organs, the ovaries, etc. I feel, for my own part, from the slight observations I have made that hereafter I shall make examinations of the thyroid in a routine way in every case of pregnancy and in every gynecological patient.

comply a cure of the local lesion, subjects the patient to the danger of an operation for metastasis to the glands at a later period when enlargement of the glands brings the patient to operation. There is absolutely no way to recognize the beginnings of cancer in a lesion of the lip except by a radical excision of the lesion and the microscopic study of the tissue excised. Then those patients who have cancer of the lower lip can be subjected to the operation of removal of the glands at the most favorable period.

I am confident that many conscientious and honest members of the profession have and may continue to treat apparently innocent lesions of the lower lip with X-ray and radium not knowing this great danger.

Among ten cases of cancer of the lip in which the local lesion was so extensive that it was necessary to resect a piece of the lower jaw there has not been a single cure. The duration of the lesion in all these cases was more than nine months, in the majority more than two years. Every case was a recurrent one. Here we see exemplified the great danger of delay and incomplete surgery in some cases in the most favorable period.

In nineteen cases the local lesion, or its metastasis to the glands of the neck, had reached such a stage that no operation was performed.

In this group the duration of the disease was one year or more. About one-third were recurrence cases.

Therefore, among 167 fully developed cancers of the lower lip, in 29 (17 per cent) the disease had become inoperable, due to delay of longer than nine months, combined in some cases with previous incomplete treatment of various kinds.

Figs. 14a and 14b (Pathological No. 14439) illustrate a fully developed carcinoma of the lower lip of eight months duration, in which there had been no previous treatment. This lesion was excised radically under local anesthesia and after the microscopic examination (Fig. 15 Pathological No. 14439) the glands of the neck were removed metastases, however were not found. It is my opinion that the prognosis in this case should be one hundred per cent. (Patient is well

February 1914—six months.) However had the glands in this case shown metastasis, the probability of a cure from our figures up to date would have been, at the worst, fifty per cent. I think, however in a future communication I will be able to show that our better methods now established for the neck operation will increase the probabilities of a cure.

As I have stated before, we cannot determine from the duration of the local growth on the lip, or from its gross and microscopic appearance, whether the glands are involved or not. When the microscope shows carcinoma of the squamous or spinal-cell type the glandular operation should be performed as if metastasis had taken place. If this is not done and the patient returns later with involvement of the glands of the neck, the probabilities of a cure are reduced from at least fifty to at most ten per cent.

My figures show that the probability of glandular involvement in primary cancer of the lower lip is thirty-six per cent, in recurrent carcinoma sixty per cent.

Fig. 15 (Pathological No. 15090) illustrates a recurrent carcinoma of the lower lip. Compare the excavated ulcer with the lesion in Fig. 14 and note the extensive infiltration beneath the skin over the chin. In this case there was a mass under the jaw and direct infiltration of carcinoma, which could be recognized with the naked eye, from the ulcer to the glands of the neck. This patient had had previous treatment over many years with caustics and X ray.

Fig. 16 is a photograph of the patient after an operation for an extensive recurrent carcinoma of the lower lip. The excision was performed with the knife and the cautery. The patient refused a second operation for the removal of the glands of the neck.

Fig. 17 shows a carcinoma of the lower lip with involvement of the glands of the neck below the jaw which had extended beyond the possibility of radical removal. This is an example of an inoperable case.

One might ask the question, Can the lesion on the lower lip be so insignificant that it may be overlooked until the patient seeks advice for enlargement of the glands of the

neck? *This has occurred once in 200 cases.* Fig. 18 is a photomicrograph of the entire lesion. There is a small downgrowth of a hypertrophied papillary body the basal cells are absent and the cuboidal and apical cells are proliferating into the dense lymphoid-cell granulation tissue some of the finer strands of these malignant epithelial cells are not clearly seen in this low power photograph but can be made out with a higher power. This patient came under observation in Halsted's clinic in 1893 with a mass beneath the left lower jaw. This had been present six months. Dr. Halsted completely excised all the tissue in the triangle beneath the left lower jaw. The tumor on section, proved to be a carcinoma, the cells from the epidermis of the skin. We then carefully examined the lower lip and found a small crack at the mucocutaneous border to the left of the middle line. The patient was not aware of its existence. I excised this under cocaine. Eight months later the patient returned with a mass below the parotid between the sternocleidomastoid muscle and the internal jugular vein. This mass was radically excised with the muscle and the vein. Microscopically a metastatic carcinoma similar to the first tumor removed from the neck was found. This patient was alive and free from recurrence five years after operation. In 1903—ten years—a letter was returned marked "Dead." Further details we have been unable to ascertain.

This observation demonstrates that an occurrence of this kind is very unusual, but it also shows that even the most minute crack, with or without a scab situated on the lower lip should be radically excised, unless it completely disappears within a few weeks. Personally I would excise a crack of this kind at once, because the lesion is so small that no one can tell how long it may have been present. I have never had the good fortune to observe such a crack, except in this case but many patients with cancer have told me of these little cracks with a scab which have remained quiescent for months before any local change.

TREATMENT OF THE PRECANCEROUS LESION OF THE LOWER LIP

The etiological factor should be sought for and immediately removed. The smoker must cease smoking the individual who carries between his lips nails or other foreign irritating material should be instructed as to the danger and advised to discontinue the practice at once. The habit of biting the lower lip should be corrected, ragged or protruding teeth filed or extracted. Individuals who use tobacco in any form (the use of snuff should not be forgotten) should be advised to discontinue it at once and be given a mouth wash of bicarbonate of soda (see Fig. 6).

The little lesion should receive no irritating treatment, not even the mildest caustics. If there is an ulcer it can be washed with a solution of bicarbonate of soda and covered with a non irritating ointment. An emulsion of bismuth in castor oil or a two per cent yellow oxide of mercury ointment has answered the purpose well in my experience. In extensive ulcerations, as shown in Fig. 6 and extensive fever blisters or chapping I have had good results from covering the area with silver foil as employed by Halsted for dressing wounds. This silver foil is kept in place by covering it with a little cotton fixed with collodion. Such a dressing will usually hold twenty four hours. It should accomplish its results in a few days.

If the lesion is small its radical local excision is not at all mutilating and it is my opinion that such lesions should be excised if they do not heal in a week or ten days. In the more extensive lesions, as shown in Fig. 6 one is justified in waiting longer. In my experience all these cases have yielded immediately to treatment. I can see no justification of any delay in smokers burn and in the wart.

The excision of the local lesion. This should be done under local anesthesia. The needle should pierce the skin at some distance from the lesion. Direct infiltration of the zone of disease itself is unnecessary and in carcinoma might be dangerous. To remove such lesions as shown in Figs. 2, 7, 11 and 14 is a very simple affair. To give them a good margin

never results in a mutilating scar. The part removed should be V-shaped (see Fig. 9) and should include the entire thickness of the lower lip both skin and mucous membrane. In closing, first pass the suture threaded with a straight intestinal needle accurately through the mucocutaneous border. This keeps the red line of the lip in perfect approximation. Then the mucous-membrane stitches are passed and the skin is sutured. The wound can be dressed with silver foil and fixed with collodion or adhesive straps. The post-operative discomfort is practically *nil* and the healing good when approximation is perfect.

When the lesion is near the angle of the mouth (fortunately this is unusual in early cases) the technique of excision and suture is a little more delicate.

The chief point to remember is never to restrict the local excision of the V-shaped piece within dangerous limits. *If in doubt, take a little more.* The margin of healthy tissue necessary to excise in lesions of the lip is narrow as compared with a lesion of similar size and type on the tongue. The sub-mucous and subcutaneous tissue of the lower lip resists the local growth of cancer to a remarkable degree while on the tongue the mucous membrane rests on muscle which is least resistant.

As a matter of fact, I have never observed a local recurrence in the hands of experienced surgeons except in very extensive primary and recurrent carcinoma. In such cases the complete excision means a plastic operation to restore the lower lip. Now if the lesion is not very extensive (that is, one in which there might be a possibility of restoring the lip without a plastic operation, if the margin of healthy tissue were made a little narrower) the danger seems greater and as a matter of fact, our local recurrences have been in this group. When the lesions have been so extensive, as shown in Figs. 15 and 16 that restoration of the lip without a plastic operation was out of the question, the surgeon has experienced no subconscious influence to restrict the margin of uninvolved tissue, so that in spite of these extensive growths the local results have been better than in the previous group.

These extensive local operations are only necessary in delayed cases, usually those which have received incomplete treatment. This group I trust, will grow smaller. In this group it is my rule now to cut the lesion out with the electric cautery giving the palpable zone of induration at least 1 cm. of margin, then the burned area is cut out with the knife. No thought is given to the restoration of the lip until the local operation is finished.

The tissue excised at the local operation in the less extensive cases is studied microscopically and if the disease proves to be a fully developed carcinoma, the gland operation is performed. Delay of a few days to a week in cases of this type has, as far as my experience goes, no element of danger.

In the more extensive cases, in which there is no doubt, clinically as to carcinoma, the decision as to the operation upon the glands depends upon the local disease and the general condition of the patient. In these very extensive cases the excision of the local area and tissue in the neck should be in continuity or *en bloc*, but in some cases the extent of the local operation, in view of the general condition of the patient is enough for one sitting. One then burns with the cautery the tissue passing from the local excised area into the neck, and at a later date performs the radical operation there.

Operation upon the glands of the neck. In the less extensive carcinoma of the lower lip the extent of the operation upon the glands varies with the position of the lesion. When the carcinoma involves or crosses the midline, one should remove the entire mass of tissue from parotid to parotid, as shown in Fig. 19. When the lesion is distinctly to the right or the left, one removes the submental area and the glands beneath the jaw on the involved side.

The dissection of the submental glands and of those beneath the parotid about the internal jugular vein seems to be most difficult. Our earlier cases show recurrences in both these areas, our later cases recurrences in the subparotid zone only. Now that we have extended the dissection to the subparotid zone by excising a piece of the parotid and

ligating and excising the upper portion of the internal jugular vein, the results are improving. Of course, in very advanced cases of glandular involvement the sternocleidomastoid muscle should also be removed. But these late cases seem almost hopeless and as yet we have accomplished no cures.

Recently I have seen a patient operated upon by Dr. Guerry of Columbia South Carolina. The neck operation was most extensive—the entire sternocleidomastoid and internal jugular vein were removed. The recurrence has taken place in the subparotid area up under the angle of the jaw. The local lesion on the lip in this case was a very extensive one at the left angle of the mouth, but there has been no recurrence here nor in the submental or submaxillary zones.

For the removal of the submental glands and those under one side of the jaw one makes a curved incision, convex downwards beginning below the lobe of the ear and extending to the jaw 1 cm. beyond the midline. This flap is dissected upwards, leaving the platysma muscle, until the base of this flap is freed to the lower border of the jaw. Then an oblique incision is made downward on the neck from about the center of the convexity: the outer and lower flap is dissected until its base corresponds to the middle of the sternocleidomastoid muscle. The inner and lower flap is dissected until the hyoid bone and fat over the submental area are exposed. Now one separates this subcutaneous mass from the lower jaw isolating and ligating the facial vessels first. In making the separation from the region of the symphysis of the jaw I employ the cautery. Then one dissects this tissue from the masseter muscle down over the angle of the jaw until the tip of the parotid gland is exposed. Then the mass is dissected with a piece of the sternocleidomastoid muscle exposing the internal jugular vein. Here one exposes and ligates the large facial vein. Now the mass has only one attachment to the tip of the parotid. The dissection extends along the base of the median lower flap dividing the platysma muscle, the fascia of the deeper muscles

pushing everything up towards the submaxillary salivary gland. This tissue is quite vascular. Having separated this up to the region of the submental area, we now have a pretty movable mass. Next the internal jugular vein is exposed and ligated in the lower angle of the wound divided between the ligatures and lifted up with all the surrounding glands. The vein is again found beneath the mastoid process and again ligated. Then one cuts through the tip of the parotid gland. The only nerve divided in this dissection is a branch to the angle of the lower lip. This nerve cannot be saved without danger of leaving involved tissue. Now the mass is pulled downwards and to the medial side and all the tissue beneath the parotid and around the piece of the internal jugular vein is dissected free, exposing the digastric muscle. The submaxillary salivary gland is enucleated and its deep vascular attachments which pass through the muscles of the floor of the mouth are clamped and tied. The mass has now only an attachment to the submental area. In making the dissection here always take the fascia and some of the muscle. These submental glands lie between the bellies of the genio- and mylohyoid muscles, and can be easily left behind if one does not dissect fascia and some muscle.

The glands of the neck which may be involved in cancer of the lip are a small chain running perpendicularly from the symphysis of the jaw towards the hyoid bone between the muscles just named a gland situated between the body of the lower jaw and the submaxillary salivary gland. This important gland will always be left behind if the salivary gland is not removed. Then there is a gland just below the submaxillary salivary gland usually palpable in the neck of most adults. Then there is a chain of lymph-glands extending from the submental to this salivary lymph-gland, from this to the tip of the parotid and down behind the internal jugular.

An incomplete operation on the glands of the neck is really worse than no operation at all. To explore the neck to see if the glands are involved is a dangerous procedure.

In our six cured cases the glands of the neck were not extensively involved in some

This case is mentioned to show the difficulty of accomplishing cure when these glands are extensively involved.

only the submental, in others only the submaxillary lymph-glands. As yet we have never accomplished a cure in the five year group when the subparotid glands have shown metastasis. However some of our recent cases with involvement of these glands and in which the more extensive dissection was performed are still free from any evidence of recurrence. Some of the six cases in which the glands showed metastasis, but in which we failed to cure, were not extensively involved. In one case the recurrence was in the submental area, apparently due to an incomplete dissection here in all the others in the subparotid area.

Later when our experience with the more recent cases has increased there will be an opportunity for a second contribution on this subject. My opinion however is that the chief hope of increasing the number of cures in cancer of the lip lies in educating the public and the profession to earlier intervention when the glands are less likely to be involved and if involved are less extensively so.

If the glands of the neck are not removed at the primary operation there may be an interval of many years, up to seven, before the metastatic area gives evidence of its presence by enlargement of the lymph-glands. Operation at this late stage should be done, but the chances of a cure are remote. We have accomplished one such cure. Fig. 20 is a photomicrograph of the metastatic gland. In this case the lesion on the lip was excised in 1893. It was a fully developed carcinoma. The patient returned eight years later with enlargement of the submental glands of eight months duration that is, there had been apparent freedom about seven

years. This mass was most radically excised and the patient is well (1913) twenty years after the first operation, twelve after the second.

Our experience shows that one should make the attempt at the radical removal of the lesion on the lip and glands of the neck at any stage of the disease whether the lesion is primary or recurrent. No necessary mutilation should be shunned. Every now and then one will accomplish cures in apparently desperate cases.

This, however is surgery as a last resort, and such surgery would not be necessary if patients were educated to seek advice early and if the profession were trained to perform the proper operation in this early stage. In fact, we have the evidence here to show that lesions of the lower lip properly excised within one month from their onset should result in almost one hundred per cent of cures.

The failures to cure in this group of 200 cases are due not only to delay on part of the patient but to bad treatment on part of the profession. These two evils can and should be corrected. It is really a very simple matter.

Basal-cell carcinoma. There are but five cases. In every case the lesion began in a defect of the epidermis below the mucocutaneous border of the lower lip. These tumors will be reported in the paper on *Cancer of the Face Including the Chin*. They have not been considered here.

Cubocellular carcinoma. There are but four examples of this type. The lesion begins on the mucous-membrane side of the lower lip. The problems in diagnosis and treatment are identical with those in spinicellular carcinoma.

THE OPERATION OF GASTROJEJUNOSTOMY AND THE PRINCIPLES WHICH SHOULD DETERMINE ITS USE¹

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THIRTY TWO years have gone by since the operation of gastrojejunostomy was performed for the first time. The year 1881 was the birth year of gastric surgery. In the original operation the jejunum was united to the anterior wall of the stomach. Two years later Courvoisier suggested that the anastomosis should be made on the posterior gastric wall, a method advocated strongly by von Hacker in 1885. In 1901 Peterson pointed out the advantages of the posterior no-loop operation as practiced by Czerny. I would point out that the description no-loop is not strictly accurate. It is impracticable, indeed inadvisable, to make the anastomosis absolutely close to the duodenojejunal junction. It is more correct, therefore, to speak of the posterior "short loop" operation. Many other minor modifications have been suggested, but none of them has become popular.

Gradually the anterior operation has fallen out of favor chiefly owing to the teaching of American surgeons. To-day with the great majority of surgeons the posterior short loop operation is the method of choice, although a few surgeons, notably Rovsing of Copenhagen, Bastianelli of Rome, Bainbridge of New York and, I believe, Ochsner of Chicago are still true to their first love.

From a perusal of current literature one might conclude that gastrojejunostomy is a panacea for all gastric ills and that failures are almost unknown. And yet, if we are honest with ourselves, we must admit that in some cases, few in number it is true, the end results are unsatisfactory. Without doubt, during the past fifteen years there has been a great improvement in the results, both immediate and remote. Acute regurgitant vomiting is a thing of the past. But are our results as perfect as we could wish? Have we yet reached the ideal?

The improvement which has taken place is attributed largely to the adoption of the

"short-loop" operation. I suggest we should ask ourselves whether there is a sure foundation for our belief in its superiority. How far is the improvement in our results due not to the particular method employed but to a general advance in our technique? At present we have little knowledge of the ultimate results of the anterior operation performed by modern technique. There are reasons why neither method is ideal.

It will I think, be agreed that a gastrojejunostomy opening should be placed as close as possible to the normal outlet of the stomach—in other words, near to the pylorus. In the posterior short loop operation this is an anatomical impossibility. On the other hand, the long loop of the anterior operation is undoubtedly a disadvantage. To put the matter succinctly the posterior operation is good anatomically but physiologically unsound the anterior operation is good physiologically but anatomically bad.

There is little doubt that the immediate results of the posterior operation are better than those of the anterior. The patients convalesce more smoothly and vomiting is less common, while after the anterior operation it may be necessary to wash out the stomach once or twice during the first few days. As to the remote results, I am inclined to think that the advantage rests with the anterior operation. After the posterior operation some patients (few in number it is true) after remaining well for months or years, begin to suffer discomfort. In some instances this is due to a mechanical defect at the site of the anastomosis, such as a constriction produced by contraction of the mesocolon encircling the anastomosis. I am quite clear that the mesocolon should be sutured to the stomach a little distance away from the suture line, and not to the jejunum or to the suture line as is commonly taught. In other cases the defect is due to a kink produced by contraction of a

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dilated stomach, to the formation of adhesions, or to rotation of the jejunum on its longitudinal axis during the process of suturing. Another cause of trouble is the narrowing of the lumen of the attached jejunum owing to the insertion of the serous suture too far from the cut edge. In some cases there is no obvious cause. It is true that some of these occurrences are preventable but so long as we are merely human, they will be met with from time to time and they do occur in the practice of the most skillful and experienced surgeons. The practical point is after which method are they less common? Whatever the nature of the defect it is a much more difficult matter to remedy it after a posterior than after an anterior operation.

It is said that the anterior operation is more often followed by jejunal ulcer but I do not think there is any positive proof of this. The proportion of unsatisfactory cases is undoubtedly small—not more than 5 per cent still such cases are met with, and the truth must be faced. It would be of great value if the members of the congress many of whom have had much greater experience than has fallen to my lot would investigate carefully their remote results. My own experience is that the results of the posterior operation are good but those of the anterior operation slightly better. At present it would be premature to advocate a return to the anterior operation but I do suggest that even received opinion may be but a unity and that it behooves us from time to time to reconsider our methods in the light of the one true test, that of time. It is only by so doing that we may learn what to reject and what is worthy to survive.

Next I purpose to consider briefly what are the principles which should determine the use of gastrojejunostomy. The correct application of any surgical procedure depends on a proper appreciation of its effects. It is a truism that it is unscientific to perform any operation when the indications are not clear and the precise effect to be aimed at is uncertain. Therefore from a clinical standpoint, it is important to answer the question: How does gastrojejunostomy act? Is the operation a mechanical one or has it any physiological effect on the gastric secretion?

The prevailing view appears to be that the operation is a purely mechanical one—the provision of a new opening into the intestine, allowing the food to leave the stomach more readily and more quickly and, in the case of a duodenal ulcer diverting the food from passing over the ulcer. For a good many years I have been advocating the view that the operation of gastrojejunostomy is a physiological one. It has been said, on the other hand, that the physiological explanation of gastrojejunostomy is rot. I will endeavor to put before you very briefly the reasons for my belief.

First, in view of the allegation that gastrojejunostomy is a drainage operation we must inquire what is the effect of gastrojejunostomy on the evacuation of the stomach. Diverse views have been expressed on this subject. My experience is that in cases in which there is no organic stenosis of the pylorus the evacuation of the stomach is slightly accelerated. Usually the stomach is empty in from three to four hours after a meal. Another means of comparing the motility of the stomach before and after operation is afforded by the study of the amounts recovered one hour after a test meal. In 60 per cent of a series of investigated cases the amount recovered after a test meal was less after operation than before but the difference is not very great. In 66 cases the average amount recovered one hour after a test meal was 190 ccm. before operation and 130 ccm. after operation. As a rule, when there is organic pyloric stenosis the motility of the stomach is improved by gastrojejunostomy. I think, therefore we may conclude that in those cases in which the gastric motility is impaired markedly by pyloric stenosis or by adhesions the operation of gastrojejunostomy results usually in a marked improvement in the evacuation of the stomach contents. In those cases, on the other hand, in which before operation the motility is unimpaired gastrojejunostomy usually hastens slightly but occasionally retards, the evacuation of the stomach but (inasmuch as this retards the acceleration falls within physiological limits, we are justified in saying that in cases in which, before operation, the motility of

the stomach is unimpaired the evacuation of the stomach is unchanged by gastrojejunostomy. These observations seem to me to be fatal to the view that gastrojejunostomy is a mechanical operation. If gastrojejunostomy acts by draining the stomach, then unless the operation hastens markedly the evacuation of the stomach, it can be of no value. This is contrary to experience. We know that after gastrojejunostomy the evacuation of the stomach may be greatly delayed, and yet the patient gains complete relief and remains permanently well. It is not easy to imagine on what grounds a gastrojejunostomy is supposed to act as a drain. The stomach is not an inert bag but a muscular organ, and we should not expect it to empty itself by gravity. There is evidence that after gastrojejunostomy the contractions of the stomach in some way control the effluent of gastric contents into the jejunum.

It is difficult by any mechanical explanation to account for the beneficial effects of gastrojejunostomy in the absence of pyloric stenosis. Take the case of gastrojejunostomy for duodenal ulcer. The view that a gastrojejunostomy acts by preventing the food from passing over the ulcer is no longer tenable. We know from the evidence of radiography that in some cases the food continues to leave the stomach by the pylorus. If the mechanical explanation of the action of gastrojejunostomy be correct, such cases would not be benefited by the operation. This, I believe, is contrary to experience. If the mechanical explanation of gastrojejunostomy be correct, the pylorus should be occluded deliberately in every case when performing gastrojejunostomy. Some surgeons do this, but so far as I am aware, there is no evidence that warrants the conclusion that the results in cases in which the pylorus has been occluded are better than in those in which this has not been done. My view is that it is immaterial whether the food leaves the stomach by the pylorus or by the stoma.

Take the case of a gastric ulcer in the body of the stomach at the lesser curvature or near the cardia. How does the mechanical explanation of gastrojejunostomy explain the relief of pain in these cases? The anastomosis cannot

prevent the contact of food with the ulcer nor does it, as I have shown previously, in variably hasten the evacuation of the stomach. There are some who deny that a gastrojejunostomy is of any value in cases in which the ulcer is not near the pylorus. I hold a strong opinion to the contrary. I have performed a considerable number of gastrojejunostomies for ulcer of the body of the stomach and have followed up the after results with great care, and in one case only has the result been unsatisfactory.

If then gastrojejunostomy does not act by drainage how does it act? This suggests a second inquiry. Has gastrojejunostomy any effect on the gastric secretion which would account for its beneficial effects? The most striking effect of gastrojejunostomy on the gastric contents is the marked diminution of the total acidity. From examination of a large number of cases I find that the average diminution of the total acidity after gastrojejunostomy is 30 per cent. To what is this diminution of the total acidity due? It is due, I think, partly to diminution of the total chlorides secreted by the gastric mucosa and partly to neutralization of free hydrochloric acid by bile and pancreatic juice, which gain entrance to the stomach through the anastomotic opening. The presence of bile as demonstrated by Gmelin's reaction was detected in the gastric contents in 73 per cent of my patients after gastrojejunostomy. It is obvious that if bile gain an entrance into the stomach, pancreatic secretion must do so as well.

Notwithstanding the absence of Gmelin's reaction in 27 per cent of my cases, I believe that the presence of bile in the gastric contents is a constant and very important feature after gastrojejunostomy. My reason for this statement is the observation that in 99 per cent of my cases there is, after gastrojejunostomy, an increase of the mineral chlorides in the gastric juice. This increase is not due to greater activity of the gastric mucosa, because as a rule there is (in 75 per cent of my cases) a diminution of the total chlorides. If then this increase in the mineral chlorides be not the result of greater gastric activity it must be due to chlorides added

from without to the gastric contents. I think therefore, the inference is irresistible that the increase is due to the mineral chlorides of the bile and pancreatic juice, which gain entrance to the stomach through the anastomosis. If this hypothesis be correct, then the effect of undoing a gastrojejunostomy should be to diminish the amount of mineral chlorides in the gastric contents. This appears to be the case. On several occasions I have had an opportunity of performing gastric analyses on patients before and after gastrojejunostomy and again after gastrojejunostomy had been undone. The result has always been the same—an increase in the mineral chlorides after gastrojejunostomy and a decrease toward the normal after restoration of the alimentary canal to its normal condition.

GASTRIC ANALYSES—ILLUSTRATIVE CASE

Before gastrojejunostomy:

Total chlorides	420
Free HCl	297
Protein HCl	280
Mineral chlorides	280

After gastrojejunostomy:

Total chlorides	365
Free HCl	200
Protein HCl	53
Mineral chlorides	0

After gastrojejunostomy was undone:

Total chlorides	341
Free HCl	0
Protein HCl	70
Mineral chlorides	253

Again if my hypothesis be correct, in those cases in which in addition to gastrojejunostomy an entero-anastomosis is performed, we should not expect to find this increase, inasmuch as the bile and pancreatic juice are diverted through the entero-anastomotic opening. I have had an opportunity of investigating this point in three cases. In all of them there was, not an increase, but a decrease in the mineral chlorides.

GASTRIC ANALYSES—ILLUSTRATIVE CASE

Before gastrojejunostomy:

Total chlorides	335
Free HCl	203
Protein HCl	75
Mineral chlorides	0

After gastrojejunostomy and entero-anastomosis:

Total chlorides	350
Free HCl	200
Protein HCl	26
Mineral chlorides	24

In this case, notwithstanding the exception of an increase in the total chlorides, there was a decrease in the mineral chlorides.

Again, if my hypothesis be correct, we should expect this increase in mineral chlorides to be more marked in those cases in which there is marked excess of bile in the gastric contents. This I believe to be the case as is well illustrated in the following analysis.

GASTRIC ANALYSES Duodenal Ulcer

Total chlorides	38
Free HCl	200
Protein HCl	31
Mineral chlorides	149

Six days after gastrojejunostomy:

Mineral chlorides	365
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Three weeks after gastrojejunostomy:

Mineral chlorides	175
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For some days after an anterior gastrojejunostomy there was marked excess of bile in the gastric contents and a high percentage of mineral chlorides. Gradually this excess of bile disappeared and was accompanied by a corresponding decrease in the mineral chlorides.

The question may be asked, Does this increase in the mineral chlorides occur after operations other than gastrojejunostomy? For example take the operation of appendectomy—is there an increase in the mineral chlorides after this operation? In 26 per cent of my cases of appendectomy there was a marked decrease, and in the remaining 74 per cent there was an increase but whereas after gastrojejunostomy the increase in mineral chlorides is accompanied by a decrease in the total chlorides after appendectomy the increase in the mineral chlorides is accompanied, as a rule by an increase in the total chlorides.

GASTRIC ANALYSES Appendicular Ganglions

Total acidity	3
Total chlorides	50
Free HCl	200
Protein HCl	67
Mineral chlorides	283

After appendectomy:

Total acidity	7
Total chlorides	368
Free HCl	274
Protein HCl	270
Mineral chlorides	283

We see, then, that after a gastrojejunostomy there is a constant increase in the mineral chlorides of the gastric juice. This increase must be due to chlorides added to the gastric juice by the entrance of bile and pancreatic juice because

(1) The total chlorides of the gastric contents are diminished.

(2) Undoing gastrojejunostomy diminishes once more the amount of mineral chlorides.

(3) If an entero-anastomosis be performed the increase in the mineral chlorides does not occur.

(4) In cases in which there is marked excess of bile in the gastric contents there is a marked excess of mineral chlorides.

(5) As a rule the increase in mineral chlorides does not follow operations other than gastrojejunostomy.

I find that the average increase in the mineral chlorides after gastrojejunostomy is 0.077 per cent. Doubtless part of this increase is due to neutralization of free hydrochloric acid and consequent formation of sodium chloride. This does not affect my argument, because

(1) This neutralization must be caused by the carbonates of the bile and pancreatic juice.

(2) If before gastrojejunostomy free hydrochloric acid be absent from the gastric contents, there is still an increase in the mineral chlorides after gastrojejunostomy.

GASTRIC ANALYSIS

Duodenal ulcer before gastrojejunostomy:

Total chlorides	59
Free HCl	0.00
Protein HCl	96
Mineral chlorides	

Duodenal ulcer after gastrojejunostomy:

Total chlorides	218
Free HCl	0.000
Protein HCl	54
Mineral chlorides	93

Roughly speaking the bile and pancreatic juice contain 0.4 per cent of mineral chlorides. I think, therefore we may conclude that on the average the gastric contents after gastrojejunostomy contain between 10 and 15 per cent of bile and pancreatic juice. The average amount of bile, therefore which regurgitates into the stomach is between 5 and 10 per cent.

If my hypothesis as to the cause of the increase of mineral chlorides after gastro-

jejunostomy be correct, then we have at hand a means of comparing the effects of the different types of operation on the regurgitation of bile and pancreatic juice. The amount of the increase of mineral chlorides gives us an indication of the amounts of bile and pancreatic juice which regurgitate into the stomach. The average increase of mineral chlorides after the different types of gastrojejunostomy is shown in the following table.

Average Increase in Mineral Chlorides per Gastrojejunostomy:

Posterior (Mayo)	0.62
Posterior (isoperistaltic)	0.06
Posterior (vertical)	0.67
Anterior (transmesocolic)	0.60
Anterior (long-loop)	0.70

The differences are small, and what there is is in favor of the anterior operation. The isoperistaltic posterior method is the least favorable. In those cases in which I have observed an excessive regurgitation, I have been conscious almost always that there was a slight twisting of the jejunum on its longitudinal axis and too great narrowing of its lumen. These observations seem to me to indicate that the type of operation is of less importance than the manner in which it is performed.

One may ask, how does a gastrojejunostomy act? Clearly where there is pyloric stenosis the chief use of gastrojejunostomy is the provision of a new outlet for the gastric contents. This function of gastrojejunostomy does not require further discussion. It is with cases in which there is no organic stenosis that I am now dealing. I think it is clear that drainage does not explain the beneficial effects of gastrojejunostomy on ulcers. From a study of my cases it is evident that the relief afforded does not depend on hastened evacuation of the stomach. After gastrojejunostomy the evacuation of the stomach may be markedly retarded and the amount recovered after a test meal may be increased considerably and yet the patient gains relief and remains permanently well. This is I think, conclusive evidence against the mechanical hypothesis as to the action of gastrojejunostomy. The conclusion is irresistible that gastrojejunostomy is a physiological operation.

It is easy to ascertain the changes in the

gastric contents which follow gastrojejunostomy but at present we must admit that we can only speculate as to which of those changes is the important factor in the relief of the patient. As I have already pointed out, a most striking feature after gastrojejunostomy is the diminution of the total acidity. As a rule, there is also a diminution of the active hydrochloric acid. Even if the active hydrochloric acid be not diminished after gastrojejunostomy or be increased there is still a diminution of the total acidity.

This suggests that it is the lowering of the total acidity which is of importance rather than merely the diminution of the active hydrochloric acid. Possibly organic acids are of more importance than is supposed and the diminution of the organic acids is one of the factors at work. That diminution of the free hydrochloric acid is not the chief factor is clear since before operation free hydrochloric acid may be absent entirely and yet the patient may gain relief from all symptoms. My impression is that in patients who have no free hydrochloric acid before operation the results are not so good as in those who have had free hydrochloric acid. Probably this is due to impairment of gastric digestion as the result of absence of free hydrochloric acid.

In cases in which there is severe chronic gastritis with abundant secretion of mucus possibly a gastrojejunostomy opening acts as a less rigid sentinel than the pylorus, and so more readily permits the escape from the stomach of indigestible mucus.

Probably the lowering of the total acidity is but part of the aid which surgery gives to Nature. The presence of bile and pancreatic juice in the gastric contents after gastrojejunostomy is so constant that it is to the action of these juices I would give pride of place in the therapeutical effects of gastrojejunostomy. It would seem that they do something more than merely modify the acidity of the gastric contents. Haply they may produce an emulsion or exercise some specific influence as to the nature of which we are completely in the dark.

Lastly as to the indications for gastrojejunostomy. In regard to the value of this operation in cases of pyloric stenosis of

duodenal ulcer, and of gastric ulcer near the pylorus, there is general agreement. It is its value in cases of ulcer of the body of the stomach and as a treatment for gastric hemorrhage which is in doubt. If my hypothesis be correct, gastrojejunostomy is indicated in cases of ulcer of the stomach even if they be not situated near the pylorus. As to hemorrhage, I believe that in the majority of cases gastrojejunostomy is an efficient treatment, because my belief is that, as a rule the hemorrhage comes not from the ulcer but from erosions of the gastric mucosa secondary either to hypersecretion or hyperacidity. Gastrojejunostomy removes both these conditions and so allows the erosions to heal. Gastrojejunostomy is contra indicated absolutely when no organic lesion is present, except in cases of severe or continued gastric hemorrhage. There are four practical lessons to be learned.

First that the type of gastrojejunostomy employed is of less importance than the manner in which it is performed. Second, that occlusion of the pylorus is an unnecessary complication of gastrojejunostomy and is based on erroneous pathology. Third, that if gastrojejunostomy be a physiological operation, its use for the treatment of gastric hemorrhage is correct and explicable. Fourth, that if gastrojejunostomy be a physiological operation, then it is as efficient a treatment for ulcers of the body of the stomach as for ulcers near the pylorus. In other words gastrojejunostomy is preferable to excision.

I regard as not proven the view as to the great frequency with which carcinoma is grafted on simple ulcer. Granted however for the sake of argument, that it is proven at any rate there is no evidence that such an event is frequent after a gastrojejunostomy has been performed. My own experience coincides with that of Professor Kocher and Dr. Gressat that malignant degeneration of ulcers occurs in less than 3 per cent of all cases after the operation of gastrojejunostomy for supposed simple ulcer. Viewed from this standpoint the teaching that excision of simple ulcers is advisable or necessary is not based on established conclusions and is contrary to clinical experience.

CHOLECYSTECTOMY VS CHOLECYSTOSTOMY AND A METHOD OF
OVERCOMING THE SPECIAL RISKS ATTENDING
COMMON DUCT OPERATIONS

By GEORGE W. CRILE, M. D., CLEVELAND, OHIO

IN reviewing the records of eight hundred and thirty two operations on the biliary tract, performed at the Lakeside Hospital by my associates Dr Bunts, and Dr Lower and myself together with those performed by other surgeons at the Lakeside Hospital we find that cholecystostomy presents rather too frequently a history like the following. For a time the wound remains quiescent, then there is some fever and pain—the old familiar pain—associated with a sense of pressure and burning at the scar which reddens, swells, becomes tender raised and after several days by opening allows the escape of mucopus perhaps bile. Immediately the symptoms disappear and after a short period of drainage it closes. After an indefinite period this cycle repeats itself. It does not satisfy or content the victim of this cyclic gall-bladder to assure him that this is a safety valve that no possible danger attends it, and that some day it may get well. He replies that he suffers keenly that his work is broken into that he is handicapped and wishes to be rid of the trouble. This means cholecystectomy which uniformly gives relief.

Such cases present to us the following definite clinical problems—Can it be determined at the time of operation whether a given case will eventuate in this malevolent cycle? Is cholecystostomy followed by any noxious after-effects? Will the mortality rate of cholecystectomy be greater than that of cholecystostomy in the cases that will be followed by the cycle of cholecystitis, eruption, quiescence? From the local conditions one can with considerable accuracy forecast the clinical behavior of the gall-bladder and the cystic duct. This prediction however is subject to modification on two principal accounts—the technique of the operation, and the after-care.

Conditions which point to the cholecystitis obstruction cycle. If the mucous membrane

of the gall bladder be gangrenous if there be a stone embedded by ulceration in the cystic duct if the wall of the gall bladder be thickened by scar tissue as a reaction to infection, and if there be no bile in the gall bladder these conditions usually will be followed by recurrent obstruction and infection. On the other hand if the gall bladder have approximated normal walls and if the cystic duct be approximately normal, then, no matter what the size or the number of stones, if the operation be performed with gentle manipulation so as to avoid any unnecessary trauma, there will be no post-operative pathologic cycle. Too much stress cannot be laid upon the necessity of gentle manipulations in the performance of the operation. What would happen to the urethra if a clumsy hand attempted to guide into the bladder a metal catheter or sound which had become corrugated by age and neglect? Or what would be the result of forcibly stuffing rough gauze into the urethra, so as to cause copious bleeding. The urethra would swell become infected, obstructed and later perhaps strictured. The base of the gall bladder and of the cystic duct resent no less the bruising and wounding of their mucous membranes by gauze or by instruments. Following such needless injury there may be occlusion by strictures for the normal cystic duct is very small and is easily closed by stricture. Finer can accomplish a more certain exploration and a more difficult extraction than can rough manipulation.

The comparative risk of cholecystectomy and cholecystostomy. In the cases in which cholecystectomy is indicated the pathologic condition of the gall-bladder makes cholecystectomy safer than cholecystostomy as the former obviates the necessity for prolonged drainage and limits the extent of infection, especially of infection of the incised wall. The mortality of cholecystectomy

depends also on the technique. The gall bladder should be exposed by an ample wound so that there is free access to its base the freeing and separation of tissue should be made by sharp dissection care being taken not to cut into the liver that bleeding and infection in that organ may be avoided. The entire gall-bladder should be freed from its attachment so that ample opportunity may be given for determining the exact place where the gall-bladder ends and the cystic duct begins, this being the point at which the division should be made. This technique causes but little reaction.

It is well to emphasize further the necessity of most careful determination of the exact point at which the division should be made between the gall-bladder and the cystic duct. If the division be made too high, so that a small part of the gall bladder is left, there may result, as I have seen the formation of a diminutive gall-bladder with distinct cholecystitis accompanied by pus formation and the formation of small stones. If on the other hand the cystic duct be divided so near its junction with the common-duct that the lumen of the latter is first narrowed by the pressure of the ligature then totally occluded by swelling this occlusion usually will be relieved by the subsidence of the swelling.

That there may be a correct division therefore it is essential to have ample room for work, and to maintain a clear field.

In cases showing chronic infection without febrile reaction the risk of cholecystectomy is less than that of cholecystostomy. On the other hand, in cases of acute cholecystitis with protective adhesions in which the cystic duct is obstructed cholecystectomy will give a higher mortality than will mere drainage of the gall-bladder for the reason that during the excision of the viscus, even with the most careful technique it is necessary to traumatize the surrounding tissues to such an extent that the local immunity of the tissues is impaired. In such cases it is probably wiser to merely drain the gall bladder interfering with the local tissues as little as possible. Later if necessary the gall-bladder may be excised.

The clinical results of cholecystectomy in many cases of pathologic gall bladder are clinically as much better than cholecystostomy as nephrectomy of a pus-riddled kidney is better than a nephrotomy. The convalescence after cholecystectomy is usually as uneventful as is convalescence after a salpingectomy for chronic suppuration. I have never seen any adverse clinical results following excision of the gall-bladder. It has been argued that the surgeon would be at a great disadvantage should there be later a necessity for operating for stone in the common-duct. To this objection one may reply that the common-duct occupies a fixed position with definite landmarks, and if a bloodless anatomical field be maintained by sharp dissection, the duct will be found easily even though it be buried as deeply as possible under overlying adherent organs.

Common-duct operations. Operations for stone in the common-duct however even in the hands of the most experienced and expert operators, yield a high mortality rate as compared with operations on the gall-bladder or with operations on the pelvic organs, for exophthalmic goiter suppurative appendicitis, etc.

In the common-duct operation no vital organ is involved but merely a duct. Death can rarely be attributed to the loss of bile or to infection of the peritoneum from bile but is due to the gradual development of an asthenic state characterized by dullness of the mental and motor reactions, a dry tongue, partial suppression of bile, anorexia, and scanty urine together with the impairment of the entire digestive system,—a progressive adynamic state which is extremely resistant to any known treatment. All common-duct cases by no means follow this course, but the severity of the post-operative symptoms is in proportion to the difficulty of the technique which in turn depends upon the number of the stones and their impactions. My most impressive example of this mortal development was in the case of a fairly good risk patient whose entire common-duct and a large part of the hepatic duct were impacted solidly with sixty five stones. The task of extracting these was not difficult and though

my patient went through the operation splendidly he died on the fifth day with the symptoms above mentioned. Neither infection, nor hemorrhage nor shock, nor ileus nor pneumonia, nor urinary suppression were accountable. What, then, did cause death?

A clue to the real explanation of this hitherto baffling sequence of common-duct operations was found just at this time in the following facts established by certain experiments on the ductless glands which at the time of this patient's death were being carried out by me in conjunction with my laboratory associates Drs. Austin, Sloan and Hitchings. The liver performs its function in part through hormone action and in part through direct innervation. It is curious that for the performance of at least a part of its function the liver requires to have a simultaneous hormone and nerve stimulation. Now the nerve supply of the liver is derived from the sympathetic system the nerve fibers pass along the blood vessels and the common-duct. As the process of evolution has thus abundantly sheltered these nerves against injury until the present surgical era they have not evolved physical qualities for their protection as have the peripheral nerves. It is well known that slight injuries will block the visceral nerves. It would appear therefore, that in the course of common-duct operation for stone performed by an operator who is unaware of this grave danger the nerve supply to the liver will be more or less blocked traumatically. If the block be light and the patient have sufficient endurance, the temporary loss of liver function will be safely bridged on the other hand the more severe the trauma of the nerves, the more completely will the nerves be blocked and the longer will that block last. This conclusion corresponds quite precisely with our clinical facts. It gives an adequate explanation of the unexpected death of my patient, and makes it evident that surgery has been riding roughshod over a serious danger.

To obviate this danger so far as possible the following operation was planned. Gentle manipulations and sharp dissections are employed throughout the whole operation

being planned so as to subject the tissues to the least possible amount of trauma. A long vertical right rectus skin incision is made with an oblique incision at its upper end extending an inch or more across the upper abdomen, the skin along the line of incision having first been thoroughly infiltrated with novocaine. The muscular tissues are then thoroughly infiltrated with novocaine and the incisions carried down to the peritoneum. The peritoneum is anesthetized and opened. By sharp dissection all adhesions are carefully divided, the dissection being rigorously carried along the white bloodless hairline between the peritoneum and the adhesion. No blood vessel ever crosses this dead white line. The whole line of dissection being bloodless, every tissue is accurately identified and no sponging is needed. The stones are laid bare by an ample incision through the duct wall, and are picked out without injuring the duct mucosa. The duct is then closed with fine chromic gut and a French needle, just as wounds of the intestine are closed provided, of course that bile drainage through the ampulla or the gall bladder is assured. If drainage of the duct itself is not required an iodoform drain is placed near but not against the line of sutures. The pre incision infiltrations with novocaine prevent shock, while the sharp dissection and gentle manipulations cause the least possible damage to the important portal nerves and to an exceedingly vulnerable environment. So far as the operation alone is concerned, therefore, convalescence should be and is, quiet and uneventful.

CONCLUSIONS

From the evidence of our cases I draw the following conclusions

1. Considering all the later consequences of infection cholecystectomy in the type of cases indicated shows less morbidity than cholecystostomy. In these cases the clinical end results of cholecystectomy are good while in unsuitable cases cholecystostomy is followed by recurrent cholecystitis.

2. I have seen no adverse effects from cholecystectomy provided that the division is made at the beginning of the cystic duct.

that no gall-bladder tissue is left and that the division does not at all encroach on the common-duct. This technique can be readily carried out.

3. If acute infection be present then in most cases cholecystostomy should be first performed followed if required by a later cholecystectomy.

4. If the gall-bladder and the cystic duct be approximately normal, then the gall-bladder should be left, cholecystostomy being the operation of choice. If the gall-bladder be thick, contains much scar tissue, be shrunken, show chronic infection of the wall, be much impaired if the cystic duct be partially or completely strictured or if a stone be impacted in the duct, then cholecystectomy should be performed.

5. All gall-bladder operations and especially common-duct operations may be performed with a minimum of shock and dis-

comfort by thorough nerve blocking with novocaine, by sharp dissection and gentle manipulation.

6. The principal causes of the higher mortality in common-duct operations are the damage done to the nerve supply of the liver and the loss of bile salts. The sharp knife dissection and the clean-cut, ample incision into the common-duct, with the consequent minimum nerve injury and minimum injury to the duct and its neighborhood, and in suitable cases the immediate closure of the common-duct by suture, will immensely improve the morbidity and the mortality following common-duct operations.

7. The mortality rate in the 832 records studied for the purposes of this paper was 74/5 per cent. This mortality rate, as well as the post-operative morbidity will be decreased by the application of the technical procedures described here.

A BACTERIOLOGICAL STUDY OF FIFTY CASES OF NON-TUBERCULOUS DISEASES OF THE BLADDER AND KIDNEY

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THE cases included in this study were chosen largely from the Surgical Service of the Presbyterian Hospital.

The work was prompted by a desire to make bacteriological as well as clinical diagnoses in cases presumably of infection. In a considerable number of the cases cystoscopy and catheterization of the ureters were done for diagnosis and to obtain urine from the renal pelvis. The urine from the bladder was always taken by catheter by the usual sterile technique. The urine was centrifuged in sterile tubes and the sediment examined microscopically. The smears were stained by the Gram method. A few drops of urinary sediment were spread on the surface of goat blood human ascites-agar in Petrie dishes, and plain agar slants were inoculated by progressive dilution of the urine depending on the number of organisms found in stained smears of the sediment. In this way isolated

colonies were usually found on the third or fourth slant. In the same manner blood ascites-agar slants were inoculated for anaerobic growth by the pyrogalllic acid sodium hydrate method. After pure cultures of the various organisms obtained by these smears were isolated subcultures were made on blood ascites-agar plain agar litmus milk plain broth, gelatine dextrose-agar and maltose mannite, inulin lactose and saccharose media.

Clinical Material

The cases studied were clinically classified as follows:

- 1—Chronic cystitis
 - (1) Hypertrophied prostate
 1. Preoperative
 2. Post-operative
 - (2) Catheter
 - (3) Cystitis cystica
 - (4) Stricture of urethra
 - (5) Prostatitis

7
4
4
4

B — Pyelocystitis
 C — Renal stone
 (f) Idiopathic
 D — Vesical stone
 E — Tumor of bladder
 F — Pyelitis
 G — Pyuria (unclassified)
 H — Essential haematuria
 I — Ureteral stone
 J — Perforating abscess
 K — Pyelonephritis

Of these patients 35 were male and 15 female.

In these 50 cases in which infections were suspected growth was obtained from the urine in 44. No growth was obtained from four cases of renal stone, one case of cystitis cystica, and one of "essential haematuria."

Organisms isolated From the 44 cases in which the urine gave growth, 73 organisms were obtained of which 59 were aerobes and 14 anaerobes. The aerobes isolated were

Bacillus coli 3
Staphylococcus albus 5
Staphylococcus aureus 3
Bacillus enteritidis 5
Bacillus alcaligenes faecalis 3
Bacillus proteus
Bacillus pyrocaneus
Streptococcus
Pseudodiphtheria bacillus
 Unidentified gram-positive diplococcus
Pneumococcus 1
Infuenza-like bacillus

The anaerobes isolated were

Black pigment-producing bacillus 4
 Gram-negative infuenza-like bacillus 4
Staphylococcus parvulus
 Gram-negative coccus
Bacillus tendalliformis
 Gram-positive staphylococci 3

Colon group *Bacillus coli* was isolated 23 times in pure culture, 10 times, with *staphylococcus* 5 times, with *pyrocaneus* twice with gram-positive diplococcus once with anaerobes 4 times, and with *alcaligenes faecalis* once. All of the stains showed a marked variability in morphological and cultural characteristics. The shapes varied from long, thick bacilli to coccus-like forms which were difficult to identify as bacilli.

Three of the strains caused hemolysis when grown on blood media, and in one

case a hemolytic and non-hemolytic form were isolated, which in other cultural characteristics were identical. On agar a wide variance in the type of growth was observed. The most frequent type of colonies were large, white opaque and non-spreading but semi-transparent amber colonies and a spreading amber growth were not infrequent.

Litmus milk was not uniformly altered as only 6 strains coagulated it, whereas all acidified it quite promptly.

All but one strain fermented dextrose-agar and 18 caused gas formation in it.

Lactose was fermented 23 times and gas was formed 5 times.

Inuline was not fermented by any of the colon group.

Saccharose showed the most variation in regard to fermentation and gas formation, as only 11 stains fermented and 2 caused gas formation.

Most of the organisms were slightly motile, but a number were non-motile. The following table shows the chief cultural characteristics.

Blood	Mannite	
Hem	Acid	3
Milk	Gas	3
Acid	Saccharose	5
Coag	Acid	
Dextrose	Gas	
Acid	Bouillon	
Gas	Cloudy	23
Lactose	Inulin	
Acid	Alkaline	3
Gas	Gelatin	
	Not lig	23

Colon-like organisms From 8 cases gram-negative bacilli were isolated which resembled *B. coli* in motility and polymorphism but which did not acidify milk nor with the exception of one strain, coagulate it. Five of these organisms did not ferment lactose but had varying ability to ferment saccharose and mannite and always fermented dextrose without gas formation. Two stains were hemolytic when grown on blood agar.

Neumann and Lehmann say that *B. enteritidis* (Gärtner) is morphologically the same as *B. coli*, but while it has power to ferment other sugars it has lost ability to ferment milk sugar. By morphological and

pathological standards no constant differentiation between *B. enteritidis*, *B. typhosus murium* and *B. paratyphi* is possible.

Three other organisms non-haemolytic on blood were isolated which not only failed to ferment milk sugar but which did not ferment mannite, saccharose, or dextrose. These correspond to *B. alcaligenes fecalis*.

Staphylococci. Next in frequency to the colon group were the staphylococci, which were present in 15 cases. The staphylococcus aureus was isolated 3 times, but never in pure culture, while staphylococcus albus was present in 15 cases, 5 times in pure culture and 4 times associated with *B. coli*. In 5 cases staphylococcus albus, aureus, *B. pyocaneus*, *B. enteritidis*, and the anaerobes were found in varying combinations.

The most striking characteristic of the staphylococci isolated was the lack of similarity of growth on different media. Practically no two strains isolated had the same fermentation reaction on sugars, and even the growth on milk broth and blood-agar was not uniform.

The following table will suffice to show the difference in cultural characteristics:

<i>Staphylococcus Albus</i>			
Blood		Mannite	
H		F	
NH	3	NF	4
Broth		Inuline	10
Clear	3	F	
Cloudy	9	NF	13
Dextrose		Saccharose	
F		F	
NF	3	NF	4
Lactose		Milk	
F	3	Al	
NF	6	Ac	4
		Coag	

<i>Staphylococcus Aureus</i>			
Blood		Mannite	
H		F	
NH		NF	3
Broth		Inuline	
Clear		NF	3
Cloudy		Saccharose	
Dextrose		F	
F		NF	
NF		Milk	
Lactose		Al	
F		Ac	
NF		Coag	

Other aerobes. Of the other aerobes isolated none were found in pure culture. *B.*

pyocaneus occurred twice in chronic cystitis due to hypertrophied prostate, and both times with *B. coli*. One case of chronic cystitis had the unusual combination of pseudodiphtheria bacillus streptococcus, and pneumococcus. A proteus-like bacillus occurred in two cases of pyelocystitis, and was gram negative in both instances.

Anaerobic organisms. In 1898 Vileton and Zuber¹ studied by anaerobic cultures a number of cases of general character where gangrene or fetid pus was present and described for the first time a number of organisms, both bacilli and cocci which were present. In the succeeding few years Albarran and Cottet, E. Rist, M. Heyde, Ghon, Mucha,² and others described anaerobes occurring in peritonitis, appendicitis, lung abscess, brain abscess, pleurisy, osteomyelitis, otitis media, and cholecystitis, and demonstrated that anaerobes are not infrequently the only or prevailing organism found in some individual infections, but that they produce pathological lesions when injected into animals, the pathogenicity varying with the special anaerobe under consideration.

Of special interest to the subject at hand is the report of Albarran and Cottet of nearly 70 cases of infections of the urinary tract studied by both aerobic and anaerobic methods, although the great proportion of their cases were examples of extravascular infection.

In 25 cases of diffuse and circumscribed urinary infiltration, anaerobes were isolated 7 times in pure culture and 12 times in association with aerobes, such as *B. coli*, staphylococci, and proteus.

In 23 cases of peritumoral abscess, anaerobes were isolated in all but 3 cases.

In these 48 cases, anaerobes were present in 86 per cent and were in pure culture in

¹ Vileton and Zuber. Recherches sur quelques espèces d'anaerobes strictement anaerobes et leur rôle en pathologie. Arch. d. méd. exp. et d. anat. path., 1898, II, 347.

² Albarran and Cottet. Des infections anaerobes chroniques. XIII. Congrès Internat. 1900, II, 26. La rôle des anaerobes chroniques dans l'infection anaerobe. La Presse méd., 1905, II, 27. Jules Cottet. Note sur les microorganismes anaerobes trouvés dans les suppurations de l'appareil urinaire. Rev. de Biol., 1906, II, 44.

E. Rist. Anaerobes Bactériens. Encyclop. I. Bactériol., 1906, 20. M. Heyde. Beitr. Klin. Chir. 29: 1001. Beitr. Klin. Chir. 1906, 347.

Ghon and Mucha. Zur Frage über die Ursache d. Appendicitis. Beitr. 2. path. Anat., 1902, II, 130. Beiträge zur Kenntnis der anaeroben Bactérien des Menschen. Encyclop. Bactériol. 1906, 200.

33 per cent. The most common organisms found were micrococcus foetidus and B fragilis each of which was found 4 times in pure culture. Others frequently isolated were B funduliformis diplococcus reniformis, staphylococcus parvulus and B nebulosus.

Albarran and Cottet also report the bacteriological study of 4 cases of cystitis and 10 of pyonephrosis.

Three of the cases of cystitis yielded an anaerobic organism, which was in pure culture in one instance. The same organism diplococcus reniformis was present in each case and is the only anaerobic organism described in relation to cystitis found in literature.

The diplococcus reniformis resembles in shape the gonococcus being but a trifle larger and is not stained by the Gram method. It is an obligatory anaerobe and does not grow at room temperature. Small white colonies appear on dextrose-agar in 48 hours, but no gas is formed. Broth is cloudy in 24 hours and a precipitate is formed. Growth is accompanied by very fetid odor. Subcutaneous abscess is formed by injection into a guinea pig.

In 10 cases of the non tuberculous pyonephrosis, the same authors found anaerobes (B reniformis B fragilis, and B ramosus) together in pure culture in one case and in three other instances in association with aërobies.

With the exception of these 4 cases of cystitis and 10 cases of pyonephrosis, no other mention of anaerobic study of infections of the bladder and kidney was found in the literature.

In my 44 cases, anaerobes were isolated in 10 cases, 4 times in pure culture, and twice as the prevailing organism. In all 14 anaerobes were isolated, 11 of which were obligatory anaerobes. The organisms might be divided for convenience of description into black pigment forming bacilli fine influenza like gram-negative bacilli, gram negative cocci, and gram-positive staphylococci.

Black pigment-forming bacilli These organisms occurred in four cases and were the prevailing form in one case. They are gram-negative, non-motile, and stain poorly. They

grow only under anaerobic conditions on blood ascites-agar slants small moist white circumscribed colonies appear in 24 hours. Two or more colonies may coalesce to form a large one but as a rule they remain discrete. Three of these bacilli did not hemolyze blood and one did. On about the eighth to the twelfth day a brown pigmented spot occurs at the summit of the colony and in 48 hours the whole colony is dark brown to coal black. The older the cultures the blacker they become. A very offensive fetid odor accompanies the growth. In old cultures festoons of black growth and isolated black colonies appear in the depth of the blood agar. The organism grows at room temperature, but best at 37° C. They are resistant, and cultures may be replanted after a month or more. The longer the artificial cultivation, the earlier the pigment appears, coming as early as the third to the fifth day. Subcultures on litmus milk agar broth gelatine and sugar media such as mannite, dextrose, inuline maltose and saccharose, have all been unsuccessful. It has been difficult to obtain pure cultures of this black pigment producing bacillus and transplants on other than blood media have yielded other anaerobes, apparently growing in symbiosis, but which were not pigment producers.

The washed growth of three to six blood agar slants, when injected intraperitoneally subcutaneously or intravenously has produced no lesions in rabbits and guinea pigs. It must be added, however that the material used had been under artificial cultivation for a number of months and may have lost its pathogenicity for animals. These organisms were isolated from a case of tumor of the bladder with a necrotic surface and accompanied by foul urine, from a case of recurrent vesical stone with foul urine, from the foul urine of a case of removal of the prostate, and from a case of chronic cystitis accompanied by slight stricture of the urethra. In all of these cases other organisms, such as B coli, staphylococcus, or other aërobies, were present. In the urine of the tumor case, the black pigment-forming bacillus was the prevailing organism, though a hemolytic

and non-hæmolytic colon bacillus and a gram negative anaërobic coccus were also isolated.

It is probable that these black anaërobic are of rather common occurrence in putrefactive infections, as I have isolated them from ischio-rectal abscesses and from the appendix, and Dick has found them in several other lesions such as fetid abscess of the lung, chronic enteritis from the throat from blood and urine of scarlet fever cases and from simple chronic tonsillitis.

Heyde² describes similar anaërobic bacilli (*Schwartzen farbstoffbildender Bacillus*) in cultures from the appendix, but says they are curved occasionally branched appear in short chains and live but a short time on artificial media. In these respects they differ from the bacilli just described but in most other respects are similar. The inoculation of animals with this bacilli caused cachexia.

Rist has described a spirillum nigrum producing black pigment which is unlike the above organism in every respect.

Gram negative fine bacilli In four cases, three of chronic cystitis and one of recurrent renal stone a very fine non-motile gram negative bacillus was isolated in two cases in pure culture and in one other as the prevailing organism. In all instances the life of the organisms is very hard to maintain on artificial media, generally lasting only from two to three generations. It grows only at 37 C. and all attempts to grow it on any but blood ascites media failed. It appears on blood agar slants in 24 hours as an almost imperceptible cloudy growth without definite colonies and is non-hæmolytic. Without great care it can easily be overlooked. It stains well, but is negative to Gram stain. Morphologically the bacillus is very short and very fine and occurs singly. With the organisms from one case of chronic cystitis and prostatitis an attempt was made to produce cystitis in rabbits by injection of the washings from ten to twelve tubes, but failed. Injected into the renal pelvis through the kidney substance, the animals died in 24 hours and the organisms were isolated

in pure cultures from the urine in the bladder and pelvis of kidney but not from the other kidney nor from the heart's blood. Autopsy in these animals revealed no macroscopic lesions of the bladder or kidney. The bacilli were grown in blood ascites broth (in large dishes) and autolysis was allowed to take place. The autolyzed bacilli and living bacilli were repeatedly injected into the bladder of guinea pigs, but no lesion was caused.

In two cases of chronic cystitis this fine bacillus was the only organism present. While numerous gram negative anaërobic influenza-like bacilli have been described, all of these have been capable of cultivation of other media.

Davis described a gram negative bacillus which he isolated from the urine, which grew best under anaërobic conditions. It grew only on blood hæmolyzed blood, and was non-pathogenic to animals.

Bacillus funduliformis (J. Halle) In one case of probable embolic pyelonephritis in which hæmatoma had been a prominent symptom an obligatory anaërobe was isolated as the prevailing organism. This bacillus was negative to Gram stain, was non-motile and grew only at 37 C. It appeared on blood ascites-agar lactose and dextrose-agar on the third to the sixth day. In pure culture, polymorphism was evident in the number of involution forms, manifested by different lengths of the bacilli, coccus-like forms, beaded bacilli, and a general tendency for all of the bacilli to be slightly curved. The organisms generally appeared singly but occasionally short chains were found. Only a very slight fetid odor was noticeable in cultures. The growth on blood ascites-agar was non-hæmolytic and consisted of fine, plainly visible white colonies with no tendency to produce a spreading growth. On lactose and dextrose a growth was obtained, and a slight amount of gas was formed on dextrose. None of the sugars tested (dextrose, lactose, mannite, inuline saccharose) was fermented. Milk was not coagulated nor acidified, inuline remained clear and there was no growth in gelatine. A varying pathogenicity for laboratory animals is reported (Rist).

Dr. George Dick. Personal communication.
Lee, Ch.
Lee, Ch.

Dr. J. Davis, J. Infect. Dis., 1906, vii, 300.

While in perhaps most instances anaërobic organisms are found in fetid exudates and often produce a fetid odor when grown on artificial media, the B funduliformis has been found in exudates which were purulent but not foul-smelling and in my case the urine while bloody was not ammoniacal.

Gram-negative cocci Gram negative cocci were present in three cases. In a case of vesical tumor from which a black pigment forming bacilli was isolated, an obligatory anaërobic gram negative coccus was present, growing in symbiosis with it. This organism corresponds to no known anaërobic coccus, but as the group is undoubtedly large it will not be specially named in this article. It appears on media in 24 hours as white colonies which coalesce and by a spreading growth cover the surface of the media. There is no hemolysis on blood media lactose, dextrose, and mannite are not fermented. The growth has a very fetid odor. On inuline and saccharose media there was no growth. Gelatine and litmus milk show a marked growth, but neither is changed. Morphologically this coccus is small, and occurs singly in groups, or in short chains.

In two other cases obligatory anaërobic gram-negative staphylococci resembling staphylococcus parvulus were isolated. One of these cases was a chronic cystitis, and the other was a retroperitoneal abscess in which bladder irritation and hematuria were present.

These staphylococci, when stained appear in small clusters of very fine cocci, which are barely discernible by oil-immersion lens. The best growth is obtained on blood ascites agar where it appears in 34 to 48 hours as dot like colonies, resembling in indistinctness the growth of the gram-negative influenza like bacilli already described. Hemolysis on blood media fails. One strain

caused slight gas formation on dextrose-agar and there was some growth on lactose without fermentation but growth on other media failed. The other strain grew only on blood ascites-agar. Fetid odor in growing cultures was absent.

Intramuscular injection of the washed growth from six tubes into a guinea pig caused no lesion, but in this instance also the organism had been under artificial cultivation for a long time.

While these two gram negative staphylococci resemble staphylococcus parvulus (Viellon and Zuber) morphologically and to a great extent in cultural characteristics, they differ in causing no fetid odor on media and in absence of growth on broth.

Gram positive staphylococci In two cases, associated with other anaërobes, a few colonies of large gram positive staphylococci were found which were strictly anaërobic. They produced large white colonies on blood agar but were non-hemolytic and produced no green. Morphologically they could not be distinguished from the aerobic staphylococci.

SUMMARY

1 Attention is called to the varying morphological and cultural characteristics of B coli and allied organisms, and staphylococci found in infections of the bladder and kidney.

2 Anaërobic organisms were present in 20 per cent of the cases examined in which a growth was obtained and occurred four times in pure culture.

3 Anaërobic organisms are described as follows. A very fine gram-negative bacillus growing only on blood media a gram negative pigment producing bacillus, and associated with it a gram negative coccus, corresponding to no known described type funduliformis staphylococcus parvulus and gram positive staphylococci.

TREATMENT OF TRANSPLANTABLE RAT SARCOMA BY FULGURATION¹

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WITHIN the last five years de Keating Hart² has published a number of papers in which he has advocated the use of fulguration as a complement to operation in the treatment of malignant growths. Following his lead many surgeons, both abroad and in this country have employed the method with varying degrees of success. By some it has been condemned as of very little or no value, while others believe it to be a decided advance in cancer treatment.

De Keating Hart mentions that many of the failures have been due to the use of unsuitable apparatus and to its employment in cases in which the method is not applicable.

In order to form a basis for the use of the method in the treatment of human tumors and to get some explanations for the varying opinions in regard to it, the writers have carried out an extensive series of animal experiments, the results of which form the basis of this paper.

The apparatus employed in these experiments was purchased in Paris from Galfie the maker who has supplied de Keating Hart with his apparatus and before it was shipped to this country it was carefully examined, tested and approved by de Keating Hart and is similar in all respects to that employed by the originator of the method. For these reasons it appears that no exception may be taken to the results of our experiments which is founded upon the criticism that faulty or unsuitable apparatus was employed.

De Keating Hart insists that the current must be of sufficient voltage to give a spark 8 cm. long. He is very insistent that the spark must be cold, so that the tissue changes which follow its application are not due to a cauterizing effect. The field of usefulness of this method of treatment is limited to localized growths without general metastasis. The tumor must be removed surgically as completely as possible complete hæmorrhage

secured and the whole field of the operation then subjected to the action of the spark. The purpose, obviously is to kill off both the gross and microscopic fragments of malignant tissue which have not been surgically removed.

The manner of accomplishing such a result is not fully understood. De Keating Hart maintains that it is not due to an actual killing of the tumor tissue by the spark, but to a change in the nutritional conditions of the region treated so that the tumor cells are not able to grow. The bearing of our experiments on such a conclusion will appear later.

The plan of these experiments includes a study of the effect of the current on normal tissues—the physiological effects obtained when stimulation is made over what may be called critical areas, such as the course of the large nerve trunks and the heart. Likewise a study has been made of the effects upon transplantable sarcoma of rats. It is these latter studies which make up the major portion of these experiments.

1 *The effect of the current on normal tissue*
The chest of several guinea pigs was shaved and the pigs were anesthetized and exposed to the high frequency spark directly over the cardiac area for varying lengths of time from 30 seconds to two minutes. The length of the spark varied from 8-12 cm. The animals suffered no serious damage or shock from this experience and recovered from the anæsthetic with very little disturbing effect. In these preliminary tests, it must be remembered, the current was applied to the intact skin of the chest wall. A further series of animals was fulgurated over the neck region along the course of the vagus, the skin being intact. No disturbing effects whatsoever were observed. It seemed to us that the current was diffused by the other tissues to such a degree that the heart was not influenced to any appreciable extent.

The next experiments were made upon dogs under ether anæsthesia. The carotid artery, internal jugular vein and vagus nerve were exposed without however dissecting them

¹ The fulguration of an anastomosis during anastomosis of arteries and veins.
Chicago, Ill., 1929. A. M. S. Co. Publishers.

² From the Harrington Fund for Cancer Research, Landon Laboratory, Cornell University Medical College, New York.

free from their common sheath. Sparks applied along the course of the vessels caused practically no disturbance to the heart. The vagus was next dissected free and supported on two glass rods away from the other tissues. An 8-cm. spark was applied directly to the nerve for a period of 30 seconds. There was an immediate change in the respiration. There were very rapid respiratory movements the heart continued to beat but was quite irregular. The nerve was then returned to its sheath and the wound closed. The animal recovered from the experiment promptly and appeared to suffer no permanent ill effects. Another animal, on which a similar experiment was made on both vagi at the same time, suffered extreme prostration, recovered very slowly and died the next day. It seems evident that to cause any serious damage to the vagus it is necessary to apply the current directly to the nerve trunk. If the nerve is protected by the great vessels or the nerve sheath, the current is diverted to such an extent that practically no damage is done.

3. *Nature of the local reaction following fulguration.* The high frequency spark produced by this apparatus is called a cold spark, because it does not immediately cauterize the tissue. The question arises as to how the effect is produced, if there is no local destruction of tissue. De Keating Hart¹ is inclined to explain the effect as being due to some subtle physiological change which is not accompanied by marked anatomical alteration.

"La plupart n'ont cru voir dans la fulguration un moyen de destruction directe du cancer. Malheureusement, au début, j'avais attaché à la sidération de la cellule cancéreuse par l'étincelle une importance que j'ai, depuis, reconnue illusoire. Or les recherches histologiques nous ont montré que la destruction, quand elle existait, était superficielle. D'où il semblait naturel de conclure que la vertu curatrice de l'étincelle était à peu près nulle et que le seul effet qu'on dût attendre d'elle était de hâter la cicatrisation des plaies cancéreuses, enserrant ainsi l'élément pathologique dans les mailles d'un tissu fibreux défensif.

"Or rien de ces deux effets destructeur et sclérogène ne me paraît suffisant à expliquer ce que nous observons. Je dirai plus, ni l'action cicatrisante, ni le pouvoir destructeur ne me semblent contribuer à la cure du cancer la première n'existant pas la seconde ne devant pas être recherchée dans la plupart des cas.

"Examinons d'abord le second: le chirurgien a enlevé avant l'étincelage tout ce qu'il était possible de séparer sans danger excessif de l'être vivant. Les organes qui restent s'ils ont droit au respect du bistouri, ne doivent pas attendre moins de l'étincelle, et celle-ci n'aura que de rares occasions de paraître l'œuvre chirurgicale sauf en quelques cas exceptionnels donc, il sera inutile de produire une escarification électrique.

"Quant à l'action cicatrisante des apparences trompeuses y a-t-elle fait croire mais l'expérience m'a conduit peu à peu à des conclusions contraires. Certes, de larges pertes de substance ont été sous nos yeux, après fulguration, rapidement comblées mais si nous examinons de près le mécanisme de ces fermetures, nous pouvons constater qu'elles sont dues non tant à une reformation cellulaire intense qu'à un énergique appel centripète des tissus nous environnants. Quand ceux-ci s'y prêtent, les téguments sont rapprochés bord à bord et la cicatrice se fait assez vite avec un aspect lisse qui dès les premières observations lui a valu le nom très juste d'autoplastie naturelle. Mais si, en revanche, la peau trop tendue ne peut couvrir la plaie, celle-ci, loin de continuer à se fermer demeure, souvent des mois entiers, sans tendance à la cicatrisation, véritable ulcération saigne mais torpide.

De même, si l'on traite des ulcères variqueux à l'aide d'étincelles de haute tension à dose et à fréquence fulgurantes, on supprime leur aspect malsain, mais on ne hâte pas leur cicatrisation. Loin de là, bien souvent je l'ai vu notablement retardée.

"Ni cicatrisante, ni destructive, comment donc expliquer l'action curative de l'étincelle sur le cancer?

"Nous en sommes encore en ce point réduit aux hypothèses. Sans entrer dans le détail des recherches que j'ai entreprises à ce sujet, je dirai simplement ici la façon dont je conçois les effets de la fulguration sur les tissus.

"L'étincelle de haute tension à dose fulgurante produirait sur ceux-ci des effets d'ordre surtout physiologique sans altération anatomique marquée. Nous savons déjà que la foudre, les courants industriels puissants peuvent déterminer des paralysies temporaires sans lésion, des troubles sensitifs ou psychiques, où le microscope non plus que la recherche des réactions de dépendance ne révèle rien de quel que soit d'anormal. De même, l'étincelle de haute tension projetée sur une peau saine produit momentanément des vasoconstrictions intenses, et, frappant le muscle sterno-cléido-mastoïdien ou le tendon d'Achille, un torticolis ou un équinisme pouvant durer plusieurs semaines et davantage. Que ce soit par une action spasmodique secondaire sur les vaisseaux, ou pour toute autre cause, la fulguration produit ainsi, nous l'avons dit, une sorte de stupefaction locale retardant la cicatrisation, c'est-à-dire la pullulation de la cellule épithéliale même au point frappé. N'est-il pas ad-

Sélecteur sans-oncologue méconnaît la nutrition du tissu et en conséquence tous les effets du cancer



CHART

The chart gives in the shaded areas the comparative size of the tumors in the two areas. Careful measurements were made of the tumors with fine calipers every ten days, the first measurement being made ten days after the tumors were planted. The tumors in the upper line are those in the control area between the shoulders, the lower line those in the experimental area which had, before planting, been subjected to fulguration. In this chart are plotted the results obtained from three different animals, which are representative of the results obtained by treating a large number of animals. In the first animal no growth was obtained in the experimental area, while in the control area it grew well, showing that the animal was not immune.

This animal is typical of a large number treated in the same fashion. In the second animal the plant was made just outside the experimental area, and the result shows positive growth, indicating that the inhibiting effect is confined strictly to the area of reaction following the spark. The third animal is typical of a small number of animals which showed no growth in the experimental area but in which the growth in the control area, although positive, quickly regressed.

In such animals we are either dealing with animals whose natural immunity is high, or their immunity has been increased by absorption of the graft planted in the experimental area.

misérable que cette même action s'exerce avec une force plus grande encore, sur la palliation néoplasique? Cela expliquerait les effets d'arrêt étonnant constatés souvent ainsi, non seulement sur la plaie opératoire mais autour d'elle, en des régions plus ou moins infiltrées de cancer où le bistouri n'est pas intervenu, mais assez superficielles pour avoir perçu le choc de l'électrode promené autour de la perte de substance.

In order to determine to what degree normal tissues are affected we fulgurated a number of guinea pigs on the abdominal wall over an area as large as a silver half-dollar for a period of 30 seconds to one minute, having a spark always at least 8 cm. in length. These pigs were killed at intervals of from one day up to six days after fulguration. The experimental area of the abdominal wall was removed and fixed in Müller's fluid for histological sectioning.

HISTOLOGICAL CHANGES

Twenty-four hours There is extensive edema of derma and subcutis, intense congestion of vessels, small hemorrhages, and considerable exudation of polynuclear leucocytes. The subcutaneous muscle fibers

are extensively vacuolated. The epidermis shows desquamation of cells.

Forty-eight hours There is still much edema and exudate. In the muscular layer there is beginning proliferation of endothelial cells of capillaries and of nuclei of the sarcolemma cells. In the epidermis there are small collections of leucocytes.

Seventy-two hours The edema of the derma and subdermal tissues is moderate. There is intense congestion of vessels and some extravasated blood. There are a few foci of polynuclear leucocytes.

Four days The skin and deeper tissues are much thickened. The epidermis is extensively eroded and the surface of the derma is extensively infiltrated with leucocytes and blood. The loose subdermal tissues show active new growth of spindle cells. The outer layers of muscle tissue show a very active growth of spindle cells approaching the sarcomatous type. Many muscle cells and bundles are completely replaced by such cells.

Five days. The main changes are in the subdermal tissues, which are the seat of extensive purulent infiltration. There is extensive overgrowth of new spindle cells in

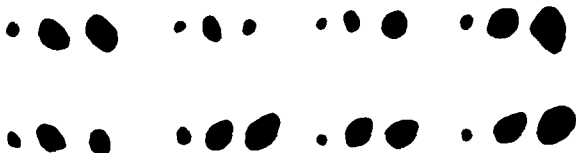


CHART 1

In this chart are represented the events which obtained in four animals. Measurements were made every ten days, beginning ten days after planting. The upper tumors are those in the control area, while the lower ones show the comparative growth obtained in the fulgurated area. Absolutely no effect of the fulguration was noted

if the tumors were planted one week after the application of the spark.

If any physiological change in the nutrition of the tissues was caused by the fulguration it must have been transitory and passed coincidentally with the healing of the local reaction.

the muscle bundles and considerable extravasated blood.

Six days. There is complete destruction of the epidermis by an abundant exudate of pus and blood. Ulceration extends to the subdermal tissues and muscles which are the seat of an active new growth of spindle cells replacing the muscle fibers and thickening the septa.

From the evidence presented as to the nature of the local reaction it seemed to us that we might expect small tumors to be decidedly influenced by fulguration even if this were done directly through the intact skin. To test this point we chose a number of rats having recently implanted tumors about the size of a small pea and subjected them to fulguration over the tumor area with a suitable spark for a period of from 30 seconds to one minute. Tumors were carefully observed to determine inhibition of growth or curative effects. In a few instances the tumor was sufficiently injured to prevent additional growth, and after a few days a small scab-like area, representing what had originally been the tumor was present. Such animals may be considered as cured. In other cases there was a marked inhibition of growth but no actual cure. In these animals it must be remembered that we are dealing with very small tumors, and that only a small percentage of these could be regarded as cured by the process of fulguration. When tumors as large as a chest

nut were subjected to fulguration it was found that there was a superficial area of edema and softening, which was later followed either by ulceration or scab formation. The borders of the tumor continued to grow rapidly and in no case was it possible to effect a cure in tumors of this size although they were repeatedly fulgurated. From these experiments it became evident that we could not effect a cure in the rat sarcoma except in the early stages of growth, soon after implantation, and then only occasionally.

In a personal communication, de Keating Hart stated to one of the writers that fulguration through the intact skin produced such changes as to immunize that particular area to the transplantation of experimental tumors. This point seemed to us to be of sufficient interest to warrant its confirmation. Accordingly we fulgurated several sets of animals for periods of 30 seconds on the back between the hips, and immediately after fulguration planted them in the fulgurated area with rat sarcoma. At the same time we planted them with the same tumor on a non fulgurated area between the shoulders. This experiment was repeated many times in order to rule out accidental errors the accompanying chart is made from typical results and shows the various fates of the implanted grafts (Chart 1). In the large majority of the animals the graft planted in the fulgurated area did not grow while the graft planted in the non-fulgurated area took

SURGERY GYNECOLOGY AND OBSTETRICS

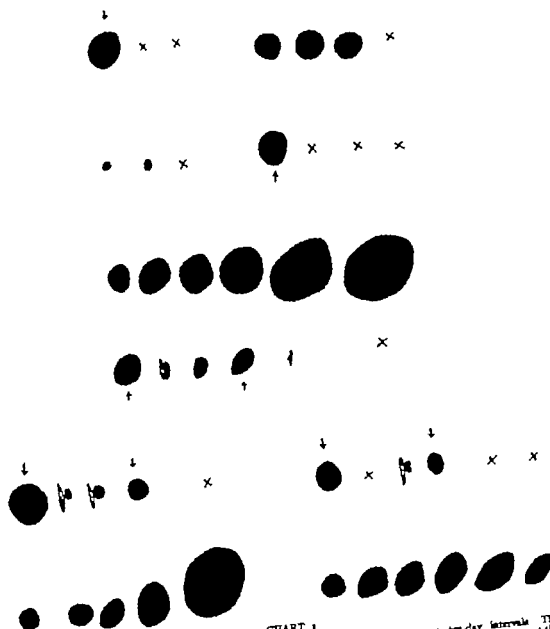


CHART 3

In this chart are shown the results obtained with five rats in which an attempt was made to cure one of the tumors by means of incomplete operation followed by palpation. The results shown in the diagrams are typical of large number in which similar experiments were made. The number of the two tumors was always chosen for operation, and the operation was done upon the tumors and at the time indicated by the small arrow in the chart. The

measurements were made 1 ten-day intervals. The tumors can be cured by this method, but not always at the first attempt, and then precautions must be taken not to let the tumor become too large. Fragment.

From the previous experiments quoted it seems probable that the cure is dependent upon two factors, viz. direct injury to the tumor by the spark and the intense reaction following its application.

in the usual way. If by any chance the graft was placed just at the border of the area of reaction following fulguration it took as readily as the graft in the non fulgurated area. In a very few instances the graft in the fulgurated area showed positive growth. It was, however, apparent that a tumor graft introduced directly into the area of reaction immediately following fulguration was, in a high percentage of cases, destroyed and absorbed without producing tumor growth.

In order to determine whether this effect was due to the immediate reaction or to some permanent change in the nutritive condition of the fulgurated area, a series of rats were fulgurated precisely as in the preceding experiment, but one week was allowed to elapse after fulguration before the tumor grafts were planted. At the end of this period the reaction had practically all passed and there was only a slight infiltration of the skin to indicate the fulgurated area. The accompanying chart (Chart 3) shows that under these conditions the tumor grafts take quite as well in the fulgurated area as in the normal area. These charts give typical instances of a large number of animals treated in this way.

It must be evident from such experiments that no permanent nutritional change is produced by fulguration so as to interfere with tumor growth after the immediate local reaction has cleared up.

In the next series of experiments the tumor tissue itself was fulgurated immediately before implantation. A thin slice of freshly removed tumor about 1 mm. thick was fulgurated for 30 seconds, cut into small grafts, and planted immediately into normal rats. In about 50 per cent the grafts showed positive growth, while a non-fulgurated graft of the same tumor gave approximately 100 per cent takes. Further difference was noted in that growth of the fulgurated tumor was much slower and there was a large percentage of regressions, indicating that the virulence was very much impaired. These results indicate that the injurious effect upon the cells directly is probably much greater than was assumed by de Keating Hart.

Finally a long series of experiments was undertaken to determine under what conditions the best therapeutic effect might be expected from fulguration. In these experiments grafts were planted in both the neck and hip region of the rats. When the growth was well established, one tumor was removed by operation except for a small fragment at its base. These remaining fragments were varied in size in the different experiments, in order to determine how large a fragment of growing tumor could be prevented from showing additional growth as a result of fulguration. After the operation the open wound was fulgurated for a period of 30 seconds to one minute, the spark being particularly directed to the tumor fragment left *in situ*. The accompanying chart shows typical experiments in this series (Chart 3).

In a considerable number of these experiments the fulguration of one tumor prevented growth but it was followed by spontaneous regression of the control growth of the same animal.

The question arises here as to whether or not we have been dealing with animals in which the forces of immunity have been stimulated by the absorption of the fulgurated tumor or whether we had just caught the tumor at a time when spontaneous regression of both tumors was about to occur. It seems hardly probable that the latter explanation could be the proper one in every instance, and there remains the definite possibility that the tumor has been injured to a sufficient degree to prevent additional growth, and its absorption has been followed by immunity. In by far the larger number of cases however the control tumor continued to grow while the fulgurated tumor was either cured at the first attempt or else it recurred as it sometimes did, as shown in the accompanying charts, and was cured by subsequent operation and fulguration.

It became evident in this work that the fragment left to be cured by the subsequent fulguration must be a thin one, not more than 1 mm. thick, or recurrence was sure to follow. The curative effect of the spark could not penetrate deeper than that into the tumor tissue. It is evident therefore, that al

though it is possible to cure rapidly growing rat sarcoma by operation and fulguration, it cannot be concluded that such happy results would follow the application of this method to growths which have infiltrated normal tissue beyond the borders of the gross tumor. It could scarcely be expected that tumor cells in the lymphatics at the border of a

tumor would be seriously injured by the effect of the spark applied some millimeters distant.

It does not seem to be necessary to invoke some obscure nutritional change to explain the effect of fulguration when the severe local reaction following the spark is quite sufficient to account for the phenomena noted.

URINARY INCONTINENCE IN WOMEN WITHOUT MANIFEST INJURY TO THE BLADDER

A REPORT OF CASES

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THERE is a type of urinary incontinence in women without manifest injury to the bladder and having no relation to fistula which most frequently comes on following childbirth, but is occasionally seen in nulliparae. In our series of 20 cases, 85 per cent were among women who had borne children, while 5 per cent were nulliparae. Two were post-operative in one, a nullipara, incontinence followed an operation for tumor of the bladder the other had incontinence following an operation for cystocele and relaxed vaginal outlet. In two cases there was an occasional dribbling of urine on standing or sudden exertion, which condition had been present from childhood. It is a disease of middle life 55 per cent of the cases were in the fourth decade. As stated by Cumston (1) some women progressively develop an incontinence of urine when no history of a surgical or obstetrical nature can be elicited. It is mostly in elderly women that this unfortunate affliction arises, occasionally at about the time of the menopause.

The onset of this affection generally manifests itself first, by an occasional escape of a few drops of urine following some unusual exertion. Later gushes of urine follow

coughing, sneezing, laughing, stooping, or walking which may ultimately lead to an absolute loss of control, compelling the patient to wear some kind of protection constantly to prevent her clothes being wet and soiled with malodorous secretions. Describing this condition Farquharson (2) says that but few infirmities are productive of so much inconvenience and mental depression or interfere so gravely with the present comfort and future prospects of its victims.

To summarize, one may call it, in general, an affection beginning in middle life, most common in multiparae. It begins as a rule with slight leakage which gradually grows worse, leading to complete incontinence with all its unfortunate and repellent sequelae. It is not cured by any known means, and although numerous operations have been devised no one has been pre-eminently successful.

The methods of treatment for urinary incontinence have been legion, and we find some of the earlier procedures (3) very crude, such as ligation of the prepuce, the use of pressure bandages, and painting of the external meatus of the urethra with collodion. The most popular forms of hydrotherapy (4)

which have been in use are The cold water foot bath for five minutes cold hypogastric douches for five or ten seconds, lumbar affusions, aromatic baths, and vaginal douches. Dueting hygienic measures, counter irritation by means of blisters, injection of the sacral nerves (Cathelin) lumbar puncture, subarachnoid mercurial injections epidural injections of sterile water or salt solution, cauterization tampons pessaries (5) massage and the use of electricity have played an important part in the treatment of incontinence. Therapy by the use of ergot, pituitrin, belladonna, hyoscyamus, strychnia, tincture of iron, tincture of cantharides, santalin chloral hydrate, potassium bromide, etc. has not received minor attention.

Many operations have been devised in the surgical treatment of urinary incontinence in women and they may be classified as follows:

A. Those which serve to create an artificial channel which can be placed under voluntary control.

B. Operations which restore the urethra with the normal power of retention.

In the first group three operations are described.

1. Procedure of Baker Brown (6) A puncture is made under the arch of the pubis with a knife or trocar. An artificial channel entering the bladder is thus formed, into which a catheter is introduced. The patient wears an ingenious apparatus which serves to keep the catheter in good position and the urine under control.

2. Procedure of Rutenberg (7) This surgeon closed the urethra and established a vesico-abdominal fistula. Control was obtained by means of a large pledget or ball valve closing the mouth of the sinus.

3. Procedure of Rose (8) A rectovaginal fistula is made, following which a plastic operation is performed on the vagina, completely closing it. The control of the urine is effected by means of the sphincter ani.

All other operations may be described as belonging to the second group and prominent among them are the following procedures.

Simple compression of the urethra by anterior colporrhaphy

Periurethral injections of paraffin. The use of an unabsorbable foreign body and the dangers arising from emboli have been the chief objections to this method. Also the result in the hands of most operators has only been that of temporary improvement.

From the anterior vaginal wall, near the cervix Schultze (9) excised an elliptical area 3 cm. long by 1 cm. broad at its widest point, and then narrowed the lumen of the urethra and the vesical neck.

Frank's (10) procedure is to place a small catheter in the urethra and then excise a wedge-shaped piece from the posterior urethral wall, including vaginal and urethral mucosa, and extending from the external urethral orifice to a point within 1 cm. of the internal orifice. The incision is now continued in an elliptical form on the vaginal wall beyond the neck of the bladder. The whole wound surface is approximated by a transverse row of interrupted sutures. The anterior two-thirds of the relaxed canal of the urethra has thus been resected, and the elliptical portion of the denudation has formed a buttress behind the neck of the bladder.

Winckel (11) removed a wedge-shaped flap from the anterior vaginal wall, the narrowest portion of which corresponded to the mucosa of the urethra.

Engström (12) removed a triangular flap of vaginal mucous membrane the apex of which corresponded to the neck of the bladder. The excision on the vaginal septum is carried down to the urethral mucosa, yet does not include it.

Transverse folding of the urethra was done by Desnos (13). He used a catheter in the bladder as a guide and cut through the vaginal mucosa exposing the upper two-thirds of the urethra. This portion was then dissected out, and a large catgut suture was placed 2 or 3 mm. from the neck of the bladder and tied so tight that the catheter could just be moved. The vaginal incision was closed with silkworm gut.

Pawlick (14) initiated the attempt to control incontinence by bringing the walls of the urethra in close permanent apposition by bending and flattening the outer end of the urethra. The external orifice of the urethra

CASES OF URINARY INCONTINENCE OPERATED UPON AT THE JOHNS HOPKINS HOSPITAL AND DR. KELLY'S SANATORIUM

Serial No. Cys. No. Date	Age, Race, Time Type of Incontinence	Duration and Operations	Diagnosis	Operation	Immediately post- op (no dis- charge from hospital)	Later result
948 Apr. 2, 1906	25 yrs.; white, I-pars; instrumental delivery followed in 2 mos. by complete incontinence on standing, sitting, etc., yrs.		Urinary incontinence; relaxed vaginal outlet.	Anterior colporrhaphy; nature of vaginal sphincter.	Well, June 8, 1906	Not located
1097 Jan. 24, 1906	26 yrs.; white, multipara. Occasional incontinence when standing, for 7 years		Urinary incontinence.	Anterior colporrhaphy; nature of vaginal sphincter.	Well, June 20, 1906	Well, July 15, 1912
57 Apr. 15, 1906	22 yrs. white, multipara. Incontinent since birth.		Urinary incontinence.	Anterior colporrhaphy; nature of vaginal sphincter.	Improved, "Incontinence never before during hospital."	Well, April, 1906
109 Mar. 2, 1906	25 yrs. white, III-pars; labor protracted and difficult. Incontinence on coughing, sneezing, and sudden exertion during yrs. Two unsuccessful operations for incontinence.		Urinary incontinence; atrophic state; relaxation of uterus, relaxed vaginal outlet.	Amputation of cervix; anterior and posterior colporrhaphy; nature of vaginal sphincter.	Well, April 3, 1906	Well, Oct. 1, 1906
1744 June 1, 1906	24 yrs., white, multipara. Partial incontinence following operation for tumor of the bladder during yrs.		Urinary incontinence (post-operative); prolapse of vaginal walls.	Narrowing of cervix, nature of vaginal sphincter.	Well, July 6, 1906	Not located.
1287 Mar. 20, 1905	47 yrs.; white, II-pars (1 & 2); delivery instrumental. Incontinence when standing and on coughing and sneezing, during yrs.		Urinary incontinence; relaxed vaginal outlet.	Anterior and posterior colporrhaphy; nature of vaginal sphincter.	Well, April 26, 1905	Imp. p. vol. July 10, 1912. "Almost complete control for 6 yrs. occasional incontinence on sudden exertion for past yrs."
3646 Mar. 2, 1906	7 yrs. white. Occasional incontinence on standing, of several years' duration.		Relaxed vaginal sphincter; relaxed vaginal outlet.	Anterior and posterior colporrhaphy; nature of vaginal sphincter.	Well, March 20, 1912	Imp. vol. July 1912. Occasional incontinence now on exertion.
8 Apr. 1911	46 yrs.; white, I-pars (20), menopause at 41 yrs. Incontinence on coughing and sudden exertion, during yrs.		Urinary incontinence, prolapse uteri.	Vaginal fixation of uterus (M. Arthur's); nature of vaginal sphincter; posterior colporrhaphy.	Well, May 8, 1911	Imp. vol. Aug. 3, 1911. "No return of trouble for 70 years." "No occurrence of incontinence on sudden exertion."
2770 May 2, 1911	26 yrs. white, III-pars (1 & 2); incontinence on coughing or sneezing.		Urinary incontinence.	Repair of vaginal sphincter.	Well, May 20, 1911	Imp. p. vol. Aug. 1911. Complete control for 12 mos., occasional incontinence after sudden exertion of 1911.
79 May 1911	22 yrs. white, I-pars (4). Occasional incontinence on exertion since birth of child. Uterine mass plastic operation on vesicles 10 mos. ago.		Urinary incontinence with relaxed vaginal sphincter; relaxed vaginal outlet.	Repair of vaginal sphincter; repair of relaxed vaginal outlet.	Well, May 29, 1911	Not located.
3042 Feb. 15, 1911	44 yrs., white, II-pars (no 1 & 2). Incontinence on coughing, sneezing, and when walking.		Relaxed vaginal sphincter; relaxed vaginal outlet.	Oval retraction of anterior vaginal wall, nature of vaginal sphincter; repair of relaxed vaginal outlet.	Well, Mar. 27, 1911	re vol. July 5, 1911. Complete control for 12 mos. occasional incontinence on sudden exertion but very infrequently improved.
3060 Mar. 22, 1911	40 yrs. white, II-pars (1 & 2), last 2 children and instrumental deliveries. Operation for 14 yrs., no control for yrs. Two unsuccessful plastic operations, before marriage, slight incontinence on sudden exertion.		Incontinence of urine due to relaxation of vaginal sphincter. Progressive poor sphincter body incontinent.	Repair of vaginal sphincter.	Improved for partial weeks.	Unimproved, Sept. 1912. Two operations (very much needed).
73 Mar. 20, 1911	47 yrs.; white, IV-pars (17 & 18). Occasional incontinence on standing, coughing and when walking during yrs.		Relaxed vaginal sphincter; relaxed vaginal outlet.	Repair of vaginal sphincter; repair of relaxed vaginal outlet.	Well	Well, July 24, 1911

CASES OF URINARY INCONTINENCE—Continued.

Serial No. Lyon No. Date.	Age, Race, Preg. Type of incontinence	Duration and Operations.	Diagnosis.	Operation.	Immediate re- sult (no dis- charge from hospital).	Later result.
2096 Apr 1915	43 yrs.; white, II para. (16 & 1), first still-born, instrumental delivery perineal repair 27 following incontinence on coughing or straining, duration, 16 yrs.		Urinary incontinence, due to relaxed vaginal sphincter.	Anterior colporrhaphy; suture of vaginal sphincter.	Unimproved.	Unimproved, July 17, 1915.
5 130 Mar. 1913	37 yrs. white, II para. (17 & 9). Con- stant flow of urine since birth of last child. Birth at term, normal labor.		Relaxation of vaginal sphincter; relaxed vaginal outlet.	Anterior and posteri- or colporrhaphy; suture of vaginal sphincter.	Well.	Well, July 26, 1913.
16 5 May 1913	64 yrs. old IV para. Developed in- continence 37s age following operation for cystocele and relaxed vaginal outlet.		Relaxed vaginal sphinc- ter.	Anterior colporrhaphy; suture of vaginal sphincter.	Well.	Well, July 24, 1913.
17 1719 Mar. 1914	37s white, III para. Incontinence of urine duration, complete for 3 yrs follow- ing vaginal suspension of uterus.		Urinary incontinence, relaxed vaginal outlet.	Suture of vaginal sphincter.	Im proved, "no control ex- cept when by me alone," Dec. 1910.	Unimproved; July 27, 1913, "better control for now; another operation more (suggested)"
18 1316 June 26, 1914	5 yrs. white, 5 para; all deliveries instru- mental, incontinence on coughing, sneezing or sudden exertion.		Urinary incontinence, relaxed vaginal outlet, malrotation of uterus.	Anterior and posteri- or colporrhaphy; su- ture of vaginal sphincter.	Well.	Im proved, July 19, 1913 "occasional in- continence; only on exertion."
19 1543 Nov. 6, 1913	47 yrs. white, X para. Complete inco- ntinence for 37s.		Urinary incontinence; relaxed vaginal outlet.	Anterior and posteri- or colporrhaphy; sur- rounding of ureters; suture of vaginal sphinc- ter.	Im proved, "almost com- plete power to retain urine."	Unimproved, July 23, 1913, "better control for now."
20 1908 May 1913	5 yrs.; white, II para, <i>leucopla delivery</i> men, age incontinence of urine for 13 men complete for men.		Urinary incontinence; depressed uteri, relaxed vaginal outlet hyper- trophied cervix.	Anterior and posteri- or colporrhaphy; suture of vaginal sphincter; vaginal suspension of uterus, amputation of cervix.	Well, June 1, 1913.	Well, Sept. 1, 1913.

ANALYSIS OF SUCCESSFUL OPERATIONS FOR URINARY INCONTINENCE. RESULT—WELL

Serial No. Lyon No.	Age	Preg.	Instrumental deliveries	Type of incontinence, duration	Time elapsed since operation
206	25			Complete loss standing duration, 3 yrs.	Discharged well, 3 yrs. men, age
207	20			Partial	37s 6 men.
22				Partial, since child	37s
240	41	1		Partial 37s; one unsuccessful operation for incontinence	37s 7 men.
3 64	5			Partial post-operative duration, 37s.	Discharged well, 37s age.
6 3724				Partial 37s one unsuccessful operation for incontinence	Discharged well, 37s age.
2003				Partial duration, 37s	37s men.
8 130				Complete duration 37s	men
	64			Partial (following cystocele operation duration 37s)	men.
20 308			second del.	complete duration, men normal men	men

ANALYSIS OF SUCCESSFUL OPERATIONS FOR URINARY INCONTINENCE. RESULT—IMPROVED

Serial No. Ory. No.	Age	Prog.	Instrumental diagnosis	Type of incontinence—duration	Time elapsing since operation
187			Int. def.	Partial; duration, 12 yrs.	7 m. 4 mos.
2124	42	?	?	Partial; "several yrs.	7 m. 5 mos.
2085	60			Partial; duration, yrs.	7 m. mos.
2700	20			Partial.	7 m. mos.
2074	48			Partial.	7 m. 5 mos.
21162		1		Partial.	7 m. mos.

FURTHER ANALYSIS OF THE RESULTS IN CASES OF URINARY INCONTINENCE

Result	Immediate Result		Late Result	
	Number of Cases	Per cent.	Number of Cases	Per cent.
Well			7	25
Improved			6	20
Unimproved		10		30
Not Located			5	

Discharged well

is drawn well forward toward the clitoris and sharply to one side then, after marking the point on that side to which it can be drawn without excessive tension a long narrow denudation is made and sutures placed holding the urethra in position. After one week the other half of the urethra is treated in the same manner. This procedure was later modified by Duret (15).

Torsion of the urethra was first employed by Gersuny (16) who after dissecting out the entire urethral canal twisted it on itself in an attempt to form a series of obliquely spiral folds dovetailing each other. He then sutured it in position. A fine bougie was inserted in the canal of the urethra to assure the operator that the lumen was not entirely obliterated.

After introducing a bougie into the urethra, Pousson (7) resects the external meatus and a portion of the urethra. After torsion of the canal through 180° it is transplanted to a point just below the clitoris.

Albarran's (18) procedure is quite similar to that of Pousson the chief differences lying in the longitudinal invagination as a means of narrowing the lumen of the urethra rather than torsion. The canal of the urethra is dissected out and transplanted below the clitoris.

Dudley (19) published an operation in 1905 the principle of which is the same as that involved in the operations of Pousson and Albarran i.e. advancement of the meatus urinarius to the clitoris. His procedure, however obviates the danger of sloughing of the urethra, as he advances the external orifice without dissecting the urethra free. The operation is described in two steps, as follows:

(a) A horseshoe-shaped surface is rather deeply denuded between the meatus urinarius and the clitoris and to either side of the urethra throughout the entire length of it.

(b) The meatus is drawn up to a point near the clitoris and is secured there by means of two sutures. The lateral portion of the denuded surfaces is now closed. Thus the sagging displaced urethra is replaced and retained in its functional relations.

He states that in many cases it will be necessary to combine with the operation some appropriate treatment for an associated cystocele, and in nearly all cases to perform perineorrhaphy to relieve relaxation of the posterior vaginal outlet. Five cases were reported, and in all the relief was immediate. Five months time, however was the longest period any one case had been observed.

For the past thirteen years, Kelly has adopted an operative procedure which we believe has been more successful than any yet proposed. This affection is due to the loss of elasticity or normal tone of the urethral and vesical sphincter so well shown by the cystoscopic picture, which in many cases presents a gaping internal sphincter orifice which closes sluggishly as the cystoscope is withdrawn. The point of vantage toward which the operative treatment should be directed is the internal orifice of the urethra and the sphincter of the bladder. The operation (20) which has been described by Kelly may be performed under local or general anesthesia, and is as follows:

A Pezzer catheter with a stem not over 5 mm. in diameter is introduced into the bladder. With the patient in the lithotomy position and slightly elevated the posterior wall of the vagina is retracted and the area at the neck of the bladder is brought down by means of forceps or four tension sutures.

The next step consists in slitting the vaginal wall down to the urethra and the bladder in the median line for about 3.5 or 5 cm. The neck of the bladder should fall at about the center of the incision. The position of the bladder sphincter is easily determined at all times by moving the catheter to and fro and feeling its head, which presses closely against the urethra. The utmost care should be taken not to cut the urethra or the bladder at any step of the operation. After making this median incision the vagina is further detached on both sides with tissue forceps and scalpel or a blunt dissector and dissected away for a distance of 2 to 2.5 cm. around the neck of the bladder. This may also be done with blunt pointed scissors, which push their way into the tissues, separating the bladder from the vaginal walls. The dissection should be deepest at the neck of the bladder. With the detachment of vagina from bladder completed the finger should be able to grasp at least one-half or two-thirds of the neck of the bladder including the contiguous urethra. Sometimes the bladder wall is so thin in the median line due to the rupture of its muscle fibers, that its mucosa shines through.

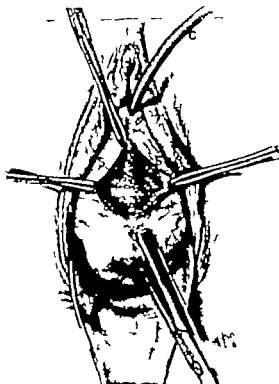


Fig. 20—Position of bladder sphincter which is determined by means of Pezzer catheter.

The torn or relaxed tissues at the vesical neck should then be sutured together using two or three mattress sutures of fine silk or linen, passed from side to side. The first suture taking in about 1.5 cm. of tissue is tied at once and may be used as a tractor. The succeeding one is applied on the outside of this, further contracting and bringing together the tissues at the neck. This is the essential part of the operation and when done the mushroom catheter should be removed. The head of the catheter escapes with a little jump as it clears the tightened reconstructed sphincter area. The more or less redundant vaginal walls, which have been detached in order to expose the sphincter area, are now resected so that the remaining tissues can be snugly brought together from side to side thus supporting the vesical area operated upon and avoiding dead space between bladder and vagina. This suturing is best done with a continuous fine catgut suture in one or two layers. In some cases it may

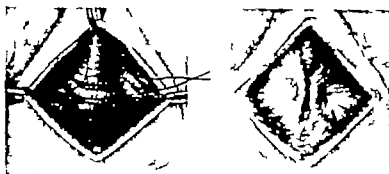


Fig. Method of insertion of the mattress suture at the vesical neck First suture tied.

be advisable to repair the relaxed posterior vaginal outlet.

The post-operative treatment is simple. The patient should not be catheterized unless it is imperative although sometimes it must be done for several days or even for a week. A Gatch bed with a half way-up posture should be used immediately after operation.

Twenty cases have been operated upon for urinary incontinence and of this number sixteen were successful. With the exception of one case (Gyn. No. 1837) in the list of patients designated as improved all have practically complete control yet an occasional incontinence on sudden exertion forces us to place them in the improved column. Communications have been received from all excepting three whose operations were performed two nine and thirteen years ago respectively. They were discharged well.

There were four cases in which the operation was not successful. All were multiparae. Three had previous operations one two unsuccessful plastic operations for incontinence another a perineal repair the third a vaginal suspension of the uterus following which there was complete incontinence. Prior to operation incontinence was complete in three cases for periods varying from three to six years. The prognosis was exceedingly unfavorable in all, because of the presence of dense scar tissue in the vaginal vault and at the site of the vesical sphincter.

CONCLUSIONS

1. There is a type of urinary incontinence in women, with no manifest injury to the

bladder which is due to an impairment of the function of the sphincter muscle at the internal orifice of the urethra. It is most common among multiparae in the fourth decade.

2. The operation as performed by Kelly is the most satisfactory thus far suggested for this type of incontinence. Entire control is given in a large percentage of cases by means of a mechanical restoration of the sphincter area at the vesical neck. Operation may be under local or general anesthesia.

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FIBROID TUMORS OF THE OVARIES

REPORT OF A CASE

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FIBROUS tumors of the ovaries have long been recognized, since in 1799 Baillie made illustrations of them and stated that their texture resembled exactly that of uterine fibroids. Madame Boivin (1) in 1834 stated that fibrous tumors are sometimes attached to the ovarium as well as to the uterus. Kiwisch (2) about 1845 merely mentions that we find solid fibroids of the ovaries. Virchow's short section on the subject in his *Geschwülste* among the earliest accounts of these tumors, mentions that they are found in domestic animals. Lepold (3) in 1876 records an incomplete list of 59 cases 19 of which were fibrous and probably included some sarcomata. Coe (4) in 1882 collected 20 additional cases.

As stated by Henrold (5) pure fibromata of the ovaries are very rare and considering the great difficulty at times of differentiating benign and malignant solid ovarian tumors, even to the best present-day pathologists, it is more than likely that many reported cases, the pathology of which is often scarcely mentioned or but vaguely alluded to were either sarcomatous in nature or comprised various modifications such as myofibroma, adenofibroma, fibrocystoma fibro-adenocystoma, etc. which are much more common, though fibrous tissue usually predominates.

When knowing, as we do that pure fibromata of the ovaries are infrequent even among tumors containing more or less fibrous tissue, their rarity may be estimated from the report of Cohen (6) who gives the frequency of sarcoma as compared to that of cystic ovarian tumors as one per cent. of Schroder one and a half per cent. of ovarian tumors and of Pfannenstiel (7) who states that fibrous ovarian tumors constitute only two to three per cent. of the solid ovarian tumors.

There is a variation of opinion as to the

age at which any fibrous tumors of the ovaries are most common. Uterine fibroids are more common during menstrual life and Coe (8) considers ovarian fibroids products of youthful and active, not of senile ovaries whereas Bland Sutton (9) believes they arise more often later in life. Considering the physiology and normal histology of the ovary at these periods I am inclined to side with Coe in his conclusions.

Ovarian fibromata vary in size from mere granules to large tumors weighing thirty to forty pounds, the smaller ones being much the more common and probably originating at times in the corpus luteum. I believe that, except in rare instances when they may be parasitic from the uterus or other pelvic structures they are primary in the ovary and are a hypertrophy of the pre-existing ovarian stroma, originating in a single focus and increasing uniformly except occasionally when some areas increase more rapidly than others which gives a nodular and even pedunculated growth.

In the gross they closely resemble uterine fibroids they are usually unilateral single restricted to the ovary and regular in contour the growth is slow and the general shape of the ovary retained they being ovoid or rounded, as a rule although often slightly lobulated and circumscribed nodular warty and papillary forms do occur. Unless quite large a small remnant of ovarian tissue can usually be found at the hilum. They vary in consistency in the absence of degenerations the more fibrous tissue they contain the harder they are. The surface is smooth glistening and gray white in the absence of congestion by torsion of the ovarian pedicle or otherwise or when not changed by more or less degeneration.

On section, in the absence of retrogressive changes, they also resemble uterine fibroids being tough somewhat elastic, milky white

in color and presenting a *whorl* like texture resulting from the interlacing fibrillary connective-tissue bundles running in all directions. Encapsulation is almost invariably present though the capsule may be very thin and be separated with more or less difficulty. Pathologists in general attach considerable importance to this point when differentiating in the gross from a malignant growth.

Various retrogressive changes may be present. There may be cystic degeneration from dilated glands, blood or lymph-spaces or by liquefaction necrosis. Coe believes the "geodes" or early cystic areas in fibromata are dilated lymph-spaces occasionally lymph-vessels, into which cells wander and increase in size with finally resulting degeneration of the fibrous tissue. Should there be dilatation of the blood-spaces the tumor would be more or less hemorrhagic. Calcification also occurs but as Whitridge Williams has shown no true bony tissue is formed. Malignant changes in an originally benign growth are proportionately no more uncommon than in the uterus and usually are sarcomatous in nature.

Ascites is frequently of early occurrence, for from the weight of these tumors, which is disproportionate to their size they often become impacted in the pelvis, irritating the rectum bladder and peritoneum. Ascites and necrosis are both more likely to occur when there is torsion of the tumor pedicle. If the pedicle be not entirely occluded arterial blood is pumped in, but there is less venous return with resulting congestion, serous effusion, and escape of blood into the tumor and even into the peritoneal cavity.

The frequency of ascites is responsible for these growths rarely becoming adherent to adjoining structures.

Of greatest importance is the differentiation of these benign fibromata from sarcomata. Before operation this may be impossible in the absence of metastases, cachexia etc. which makes the condition hopeless. It is therefore the duty of the surgeon to make the differential diagnosis at operation and even then it may be difficult if not impossible as these tumors have many points in common.

The history of the case is important, for although sarcomata may occur at any age, they are more common in infancy and adolescence whereas fibromata occur usually during the reproductive period. Fibromata are of much longer duration and are slower in growth than sarcomata, which enlarge rapidly. In the absence of pain fever etc. resulting from infection or necrosis of a pre-existing tumor a rapid increase in size of a long harbored, firm movable tumor would lead one to suspect a malignant transformation. Sarcomata are frequently bilateral and metastasize early to the uterus, opposite ovary etc. whereas fibromata are usually unilateral and being benign do not metastasize. Sarcomata resemble in general the form size and color of the fibromata of the ovary except that the surface is smoother and it is not so often nodular in outline. The color is more a yellowish white and the minute yellowish areas of necrosis which appear on section are heavily in favor of sarcomata. Sarcomata may be gray or pinkish on section, depending on the blood supply which is here more pronounced than with the usual fibrous growths. The consistency of sarcomata varies, depending upon the type and the amount of fibrous tissue present. The spindle-cell variety is firm, but as a rule softer than fibromata and the round-cell type is sometimes as soft as brain matter. Ascites and the lack of adhesions are common to both of these tumors. Sarcomata may be encapsulated but are not as a rule.

The matter of treatment is not difficult if the growth is merely fibrous simple unilateral oophorectomy, or even resection is sufficient but if it be sarcomatous, the uterus and lateral structures on both sides should all be completely removed.

The following case presented several diagnostic difficulties and proved unusual in that the microscopic examination showed it to be composed entirely of fibrous tissue.

The patient (Mrs. O—Gyn. N. 526) was a woman of 54, married 33 years IV para youngest child 12 years old, though she had had abortions at three months, one year ago. Menstruation had been normal though the menopause nine months



Fig. 1. Pure fibroid of the ovary split through its long axis distal to attachment of its pedicle. A B C areas from which blocks were cut (See Figs. 3, and 4)

ago was preceded by irregularities of the flow. There had been no subsequent bleeding and but slight leucorrhoea. She entered the hospital complaining of tumor in the lower abdomen some recent headache an umbilical hernia some dull aching on walking and constipation. She had recently lost considerable weight and had had more or less dull ching in her lower abdomen, with occasional sharp pain in that region. She had suspected an abdominal tumor for about a year and had been certain of it for the past four weeks.

Physical examination. The family past and personal histories were unimportant as was the physical examination, except that the abdomen which was somewhat distended, was regular and symmetrical in outline. There was slight movable dulness in the flanks but tympany at the greatest prominence of the abdomen in the region of the umbilicus through which there was a small reducible hernia. In the lower abdomen most prominent in the midline there was an oval hard movable tumor reaching as high as the umbilicus. The kidneys were not palpable nor were there any signs, symptoms, or history of gall-bladder trouble or involvement of the appendix.

Pelvic examination. The outlet was relaxed the cervix lay in the axis of the vagina and contained a small pedunculated polyp. The uterus as lying in the pelvis small and freely movable. Left tube and ovary small and movable right tube and ovary not made out. The tumor was above the brim of the pelvis and could not be pushed down into it. The urine was normal with a specific gravity of 1.020. Hb. 80 per cent B.P. 50 mm Hg.

Operation. Bilateral salpingo-oophorectomy, p-pectomy repair of umbilical hernia and separation of adhesions. The abdomen was scrubbed with soap and water alcohol ether and bichloro-

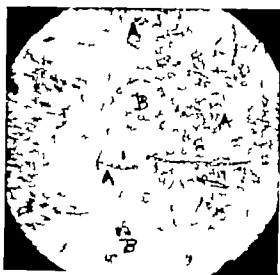


Fig. 2. Section from block A, Fig. 1. A A homogeneous, slightly granular debris. B B blood-spaces, the walls of which show no cellular structure. The light fibrous reticular network is not well seen here.

acid and then opened in the midline below the umbilicus. An oval tumor of the right ovary the size of a grape fruit was found, which was slightly adherent to the omentum these adhesions were separated. There was considerable blood stained fluid in the abdominal cavity. A further description of the organs is given in the pathological report.

The tumor had an elongated pedicle of broad ovarian ligaments, which were twisted several times. There was no sign of lymphatic enlargement or metastases. The pedicle was tied off with silk and plain gut. The appendix was normal and was removed. The gall bladder contained two stones the size of hazel nut but these were not removed, as the patient's condition did not warrant doing so. The umbilical hernia was resected and the abdomen closed in layers. The patient's recovery was uneventful and she left the hospital on the twenty-seventh day feeling quite well.

PATHOLOGICAL REPORT

Specimens. Both tubes, an ovary and a firm ovoid tumor.

Right Ovary. The tube and ovary were removed *en masse* with an elongated pedicle of broad ligament which showed evidence of torsion. The ovary (Fig. 1) was oval in shape very firm in consistency measured 10 x 10 x 17 cm. and weighed 850 gm. Its surface was smooth, slightly irregular and glistening except for an area three times the



Fig. 3. Section from block B, Fig. 1. A, capsule of fibrous tissue between the fibers of which are many free red blood cells B B blood vessel D no very definite demarcation between the capsule and more cellular fibrous tissue beneath C C, denser fibrous connective tissue

size of a postage stamp to which several tags of omentum were adherent. The color was a gray white except on the convexity opposite the attachment of the pedicle where it was deeply congested and showed dilated vessels beneath the peritoneal covering. On section the tumor was found to be encapsulated though the capsule varied in thickness and stripped with more or less difficulty. The cut surface was tough and fibrous without evidence of necrosis. The superficial congestion mentioned extends deep into the tumor tissue and is a deep raw beefy red 1 to 2 cm. beneath the surface gradually shading off until colorless at the bottom of the incision just within the attachment of the pedicle. The congestion is seen at C (Fig. 1). The right tube measured 11 cm. in length and 0.5 cm. in diameter was thatched with prominent vessels and was dark red in color. It was patent and without adhesions. The left tube and ovary were normal in size and appearance.

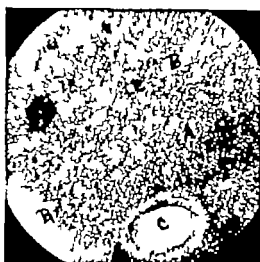


Fig. 4. Section from block C, Fig. 1. A, dense fibrous connective tissue B, B less dense connective tissue than A, cordiform in appearance C, blood vessel

Microscopical examination. Hematoxylin and eosin stains. Sections from different areas vary somewhat. From block A Fig. 1 (see Fig. 2) they show a reticular network of degenerated fibrous tissue with several dilated blood spaces, the walls of which show no cellular structure. No staining cells are seen excepting a few scattered degenerating white blood cells and small round cells in the meshes of the fibrous tissue and in the non-staining homogenous, slightly granular debris filling the fibrous meshes.

Sections from block B Fig. 1 (see Fig. 3) show the firmer non-hemorrhagic part. On the surface is seen a capsule of several layers of parallel connective-tissue fibers, with but few nuclei but with many free red blood cells between the fibers. Deeper in the section the fibrous tissue is more compact, the bundles of parallel fibers interlacing and being cut at all angles. Here the nuclei are very much more in evidence being so compact in places that little of the cell except the nucleus is seen. The nuclei are rounded or oval, occasionally slightly irregular staining uniformly and evenly though rather lightly. No mitotic figures or evidences of direct division are seen. The vascularity is not pronounced though several large and

smaller vessels are seen. The cells are apparently connective-tissue cells, considerably hypertrophied and densely packed.

Sections from block C Fig 1 (see Fig 4) show much the same picture as those from block B except that there are many irregular areas where the nuclei are more or less widely separated and the tissues appear somewhat oedematous. Scattered through the sections of blocks B and C are groups and masses of red blood-cells. Here and there is seen a white blood-cell or lymphoid cell filled with a granular brown pigment, originating most probably from degenerated red blood-cells.

Using Weigert's modification of Van Gieson's stain for differentiating the fibrous tissue shows up very beautifully as red

homogenous streaks and bands and is seen to be the only constituent tissue present.

Diagnosis. Pure fibroma of the ovary.

In conclusion, I wish to thank Dr Hunter Robb for the privilege of reporting his case.

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MIXED-CELL TUMORS OF THE SOFT PALATE

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WHILE, in the cephalic region, the salivary gland are the most frequent site of mixed-cell tumors, yet they do occur in other portions.

Wood in his study of 59 cases report four from the lips, two from the pharynx, two from the neck, one from the cheek, and one from the palate just anterior to the folds of the soft palate, which recurred after removal, the recurrence extending into the soft palate. Verheef also has reported five cases of mixed cell tumor of the lachrymal gland.

A search of the literature discover relatively few occurring in the soft palate although the number arising from the hard palate is considerable. A number of cases have been reported in the French literature, where this topic seems to have been one of considerable interest.

Etiology. There has been much discussion as to the etiology of these. Alami inclines to class them as developing from embryonic pluripotential cell. The German school believed them to be of epithelial origin, while the French school believed them to be of epithelial origin. J. B. Pissance concludes that these tumors are not of glandular origin but rather are the result of the proliferation of aberrant epithelial element resulting from a process of invagination.

McCarty in his study concludes in the seventh paragraph that connective tissue and parenchymatous element both tend to revert to embryonic type. In the next that there is little evidence that these tumors arise from proliferating adult epithelium or endothelium. In the ninth that there is considerable evidence to support the theory that these tumors are mesotheliomata of embryonic origin.

Wood concludes as follows:

1. There is a group of extremely complicated tumors occurring in the facial region which contain element from both epithelium and mesoblast in most intimate relationship to each other.

2. The complicated structure of the stroma, containing as it does such elements as embryonic connective tissue, cartilage, bone, fat, and lymphoid tissue, and, very rarely, striated muscle, is explained most easily by the assumption of an embryonic replacement of mesoblast.

3. The structure of the parenchyma is slightly characteristic in morphology that its epithelial nature in all cases can only be considered as probable, yet in about 24 per cent of the tumor examined the presence of epithelium is undoubted. The form and relationship of the cells of the parenchyma do not furnish sufficient data to justify us in regarding these cells as of epithelial origin.

4. The theory of early embryonic displacement of epithelial tissue during the process of formation of the parotid and submaxillary gland and the brachial arches may account for many of the morphologic peculiarities of the cells of these tumors, especially the lack of any typical features which we associate with epithelium.

5. The same condition may be seen in the epithelial cells of congenital moles in which the epithelium is with difficulty distinguished from connective tissue cells, owing to its close connection with the stroma of the tumors and its undifferentiated type.

The mixed tumors of the salivary gland run a clinical course strikingly different from the sarcomata and anfibromata in that they are slow-growing and generally are benign. The regional lymph nodes are not enlarged and recurrences are likely to remain local in a considerable number of the cases.

The usual conclusion that these tumors occur only in young people seems not to be substantiated by the ages collected, one case occurring before the age of 20, four from 20 to 30, two from 30 to 40, two from 40 to 50, three from 50 to 60, one from 60 to 70, and one over 70, thus 50 per cent occurred after 40 and 35 per cent after 50. While these are the ages at the time of operation, et al. of those ages occurring after 40, 4 were fatal to

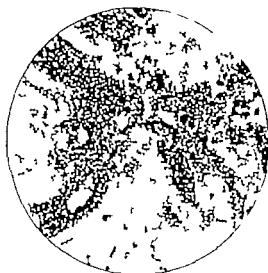


Plate 1. Tumor mass adjoining cartilage.



Plate 2. Mantle of cells around blood-vessels.

have begun at 43 51 52 59 respectively. The three in which the duration of growth was not stated were reported at 41 57 55 and in the latter two it seems safe to assume that they did not begin until after 50. The duration of growth generally is two or three years but it varies from a few months to twenty years in this series of cases and depends upon, first location second the rapidity of growth and third the susceptibility of the patient to the resultant discomforts, named in the order of their prominence—first interference with phonation second deglutition third respiration.

They occur on either side of the palate in about the same proportion but rarely in the middle. They vary in consistency according to the predominance of the epithelial or endothelial fibrous, chondromatous, or myxomatous elements. They are benign. In the 14 cases there is no mention of recurrence of glandular involvement, or of metastases but we must remember that the location of the tumor demands early operation if there be any considerable growth, and since this rapidity of growth seems in some cases to be largely due to the growth of the epithelial elements as pointed out by Dr West in his pathological report on Case 1 it would seem that the early removal had much to do with their benignity.

Wood found in his series of parotid cases that 45 per cent of the cases he was able to trace recurred locally and in 20 per cent of these recurrences there was evidence of internal metastasis.

In view of the occasional malignant degeneration of well-defined mixed-cell tumors due to the sudden lighting up of activity in certain ones of the epithelial or mesoblastic cells it would appear not improbable that they might primarily develop into the hybrid carcinomata and sarcomata seen occasionally in the parotid and testicle.

Mrs. F. F. S., 8 years old. Family history negative. About two years ago she first noticed a small tumor, the size of a cherry, about mid way in the right side of the soft palate. This has increased in size up to the present time. Examination shows a tumor about the size of a plum in the right side of the soft palate. Apparently it is encapsulated and non-adherent, the mucous membrane moving freely over it. Under general anesthesia it was easily removed, no hemorrhage. There has been no recurrence after lapse of two years. In view of the generally accepted opinion that these tumors arise from persistence of embryonic cells, it is interesting to note that this patient had also another developmental anomaly—a dydelpbic uterus—i. e., separate uterine cavities opening through fused cervix into single vagina.

Pathological report of Dr. O. J. West. Tumor is 3.5 x 5 cm. in size, encapsulated and nodular. The nodes are of softer consistency than the re-



Plate 3. Mixed portion of tumor

malader of the growth, giving the impression that they are younger and more rapid-growing than the other portions of the tumor.

On section, the tumor appears fibrous in character but contains small islands of cartilage, and scattered through the growth are quite small, dark areas, apparently without stroma. These areas are most prominent in the nodular portions of the tumor where the appearance approaches that of carcinoma.

Microscopical appearance. The major portion of the growth is composed of fibrous connective tissue among which are occasional involuntary muscle fibers and quit large islands of cartilage (Plate 3).

Throughout the growth are areas and strands of deep-staining cells. These cells have a rounded nucleus, which varies in size from that of the lymphocyte to the large vesicular nucleus of the embryonic type of cell. In many places it can be determined that these cells surround the vessel lumen and follow its course (Plate 3). In places they are plainly invasive, this being most prominent in the nodular portions of the tumor (Plate 3).

The microscopical picture is that of an endothelioma. The location and character of this tumor led to the assumption that it arose from embryonic cell rest or inclusion, and the similarity between it and the mixed-cell tumors of parotid and testicle is pronounced.

McLeod reports a youth 30 years old tumor in the soft palate, duration, ten months growth, rapid. During the past three months he had great difficulty in talking, breathing and swallowing. The tumor was not adherent. It lay between the two surfaces of the right side of the soft palate, displacing the uvula to the left, and bulging into

the pharynx as far down as the tonsil, which was concealed by it.

Gross reports a female aged 35 tumor in right side of soft palate, duration four years. It increased slowly until it interfered with mastication and deglutition for months. It interfered considerably with speech. Examination of the mouth showed a large tumor taking in a large portion of the oral cavity situated mostly on the right side but encroaching well over the median line. It was removed by enucleation. The tumor weighed 75 gm. and measured 7.5 x 4 cm., which showed it to be sarcoma endoperithelial à travers myxochoondro-fibromateuse.

3. Maedaire and Durrieux report a male 7 years old, with tumor in the left side of soft palate. It reached to the raphe. Tumor was the size of cherry. It began 20 years before, but had remained quiescent for many years. It was non-adherent, firm, quite smooth and slightly lobulated. On microscopical examination it was called an epithelioma with fibrous stroma. Twenty years before the patient noticed for the first time slight enlargement in the mouth, which gradually increased in size for while and then remained stationary for years. It did not give rise to any pain or functional trouble, and did not affect the voice in any way.

4. Sébilleau reports a female aged 5, location of tumor not noted. It was as large as a mandarin, and limited to the soft palate. It was enucleated without difficulty. The microscopical examination was not completed.

5. Von Gebourod's case was a female aged 55, median tumor, duration unknown, although she had had dysphagia for two or three years. Increasing difficulty in deglutition caused her to go to the hospital. Examination of the throat showed the soft palate to be greatly depressed by a median rounded tumor whose lower end touched the base of the tongue and caused the uvula to deviate to the right side. It was removed by cutting the pedicle.

After hemorrhage had ceased, it was ascertained that the insertion of the tumor was on the superior surface of the soft palate, in the median line, near the point of insertion of the nasal fossae. It measured 8 to 9 cm. and was long in volume, like a large thumb fibroid. On microscopical examination the fibrous stroma was very dense with spaces containing fatty tissue. The lining of the tumor was composed of several layers of keratinized cells. Underneath this, an infiltration of rounded cells aggregated, similar to adenoid tissue.

6. Berger reports a female aged 50 tumor of the left half of the soft palate, causing deviation of the uvula, no disturbance whatever except change in voice. The tumor was smooth, firm and very hard. It was extirpated with difficulty because of existing adhesions. Microscopical examination showed there was mixed tumor.

7. A male, 30 years old, had mixed-cell tumor

of the parotid, which was removed. A year later he had a recurrence at which time a mixed tumor was found in the right side of the soft palate. The tumor was large, slow-growing, uneven, lobular the ulcer was nasal and rough, phonation and deglutition were interfered with. Tumor was removed by a long vertical incision in front of the mastoid process with great difficulty. Microscopical examination showed the encapsulated tumor containing both epithelial and connective tissue the latter predominating.

8. A male aged 31 he experienced no trouble except change of voice. The tumor covered the entire left half of the soft palate. Encapsulated, lobulated, mixed cell in which the epithelial element predominated.

9. Heron reports a male, 57 with an enormous tumor in the right side of soft palate, encroaching on median line. No symptoms except dyspnea. After admission to hospital, and prior to operation, he had a severe attack of dyspnea, and died a few minutes later. The tumor removed post-mortem, showed epithelial elements in small amounts and various forms of connective-tissue elements, mainly myxomatous and enchondromatous.

Schwartz reports a female aged 34 pain in throat, slow-growing tumor which had been stationary about six months. The tumor is situated in the right pillar of soft palate. At operation, it was found firmly adherent. It weighed 30 gm. and was of myxomatous and cartilaginous cells and epithelial cells.

1. Escat's case was female of 65 duration of tumor many years. For past six years patient was conscious of a nut-sized lump in the soft palate. Phonation was affected, respiration difficult when reclining. A pear-shaped tumor was found in the hypopharyngeal isthmus, reaching to the epiglottis. It was removed with difficulty. Severe hemorrhage. Microscopical examination showed tumor to be composed of epithelial and connective tissue.

Cuggenheim and Ripault case was aged 44 size of tumor is unmentioned. For eight months had experienced sensation of weight in back of mouth accompanied by straining but no pain. Difficult deglutition. Tumor in the left half of soft palate. On microscopical examination it was called myxosarcoma, with fibrous formation and leucocytic infiltration.

3. Halstead case was male 55, who had acute attacks of inflammation of the throat and some hoarseness of voice, which was normal except at these intervals. Tumor was left-sided and sublingual, the swelling being greatest in the soft palate above the arch. It had been known for the past 20 years. Removed by Halstead. The tumor was 7 cm. long and consisted of connective tissue in which are areas filled with epithelial cells the connective tissue loose, with a tendency here and there to cartilaginous or mucoid tissue some hyaline



Plate 4. Showing the proliferation of tumor-cells around the blood-vessels.

degeneration some areas infiltrated with lymphoid and plasma cells.

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THE ASCENDING INFECTION OF THE KIDNEYS

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IN a paper published from this laboratory, Steinke (1) reviewed the literature both clinical and experimental of the operations which have been performed for the anastomosis of the ureter with the intestinal tract and concluded that the problem of one of physiological and surgical mechanics and a such should be open to solution. It is evident from this review that general peritonitis, ascending infection of the kidneys and cicatricial contraction of the opening into the bowel are the three difficulties which oppose themselves in the order given to the success of the operation and that of these three difficulties the ascending infection of the kidney is of the greatest importance. Before this ascending infection can be prevented we must have a clear knowledge of the pathway by which it reaches the kidney for if the infection proceeds through the lumen of the ureter some valve construction comparable to that valve action of the normal ureteral orifice must be devised. This has been more or less successfully accomplished less by such a method as that devised by Coffey more by the trans-plantation of the ureteral orifice itself or the entire inguotum as in the operation devised by Maydl. But if the infection travel by way of the blood vessel of the ureter which is highly improbable or by the lymphatics, the surgical difficulties to be overcome assume an entirely different nature from the mechanical problem of a valve construction to protect the lumen of the ureter.

The problem of ascending infection of the kidney therefore becomes the fundamental problem to the operation of the successful anastomosis of the ureter with the bowel but the common clinical occurrence of a spontaneous ascending infection of the kidney demands also its true explanation and the rapid development of the method of cysto-

scopic examination of the bladder and ureters demands a clear understanding of the truth so that the specialist may take the proper measures to prevent the accident of an ascending infection following his manipulations. If the infection travels upward through the ureteral lumen he must turn his attention to faultless technique or even refrain from ureteral catheterization in the presence of a cystitis while if the lymphatic system is at fault his attention must be directed toward the exciting ulcerations of the mucosa and toward the scrupulous prevention of any instrumental injury or tearing of the mucosa. It might further be advisable for the cystoscopist to direct his attention to the treatment of the ulceration of the bladder mucosa rather than to be content with the treatment of the general cystitis.

In Steinke's paper the suspicion was raised that the pathway along which the infection ascends is the lymphatic system of the ureter and kidney. A second paper from this laboratory by Stewart (2) records the results of a precise study of the question of ascending infection. By using sections of small arteries hardened in formalin (Fig. 1) he succeeded in producing an unusual pathological condition—an ascending infection which was primarily a pyelonephritis, with a secondary general involvement of the kidney. In the early stages the picture was that of a pure pyelonephritic infection the late stages showed the usual picture of ascending infection. The peculiar picture seen in these cases could only be explained by assuming that the infection had traveled upward through the lymphatics of the ureter and the conclusion among others were that ascending infection of the kidney quite often takes place through either the lymph or the blood vessels of the ureter. When infection takes place in this way it seems almost positive that the lymph

vessels of the ureters are the carriers of the infection." The lumen of the ureter is less often a factor in ascending infection of the kidney than has previously been supposed.

In these experiments the virulence of the infection rather than its duration determined its extent. In no case did time seem to bear any relation to the extent of the infection.

The suggestion was advanced in this paper that one of the chief difficulties met in the transplantation of the ureters is offered by the infectious ulceration of the lips of the intestinal wound bacteria, ordinarily not especially virulent in the intestinal content, become virulent when growing on this ulcerated surface with the result that the end of the ureter dips into a virulent colony of pus-producing micro-organisms.

Coincident with Stewart's paper appeared the first article by Bauereisen (3) regarding experimental work on the question of ascending infection, and using the tubercle bacillus as an infecting agent. This work led to the following interesting conclusions. First a bladder with intact mucosa cannot be infected with tubercle bacilli. Second if the flow of urine is not hindered tubercle bacilli present in the bladder cannot reach the kidney pelvis intra ureterally. Third stoppage of the flow of urine by marked stenosis or by obliteration of the lumen of the ureter will, as a rule result in an urogenous ascending tuberculous of the kidney. Fourth an extensive tubercular cystitis is carried first into the wall (adventitia, muscularis, submucosa and finally mucosa) of the lower segment of the ureter and wanders gradually in the external layer toward the kidney.

The justification for such conclusions rests finally upon the demonstration in normal tissues of a network of lymph-channels which should be anatomically capable of taking up and transmitting an infection from one part of the urinary tract to another part. Such a network should also be demonstrable in the mucosa and the submucosa.

Mascagni in 1787 showed that the lymph vessels of the upper ureter went into the kidney and those of the lower ureter went into the lateral lymph nodes of the anatomical pelvis but the earlier information on the

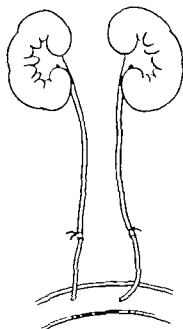


Fig.

lymphatics of the ureter is meager and contradictory. References to this earlier literature will be found in the work of Sakata (4) whose findings are as follows.

1. No network of lymph vessels is demonstrable in the mucosa and submucosa of the ureter—at least not by means of Gerota's injection method.

2. On the other hand, there are in the muscle sheath and on the external surface of the ureter well-developed lymph-vessels which, for the most part, lie parallel with the blood vessels.

3. The afferent lymph vessels are present chiefly in the central or middle portion of the ureter and go to the lumbar glands which lie both beside and anterior to the aorta and the vena cava and internal to the common iliac artery.

4. The lymph-vessels of the lower section of the ureter go either directly into the hypogastric glands or else they unite with the lymph-vessels of the bladder.

5. In the upper section the lymph vessels which go directly into glands are not constantly demonstrable but in case they are demonstrable they go to the glands which lie far above beside and over the ureter.

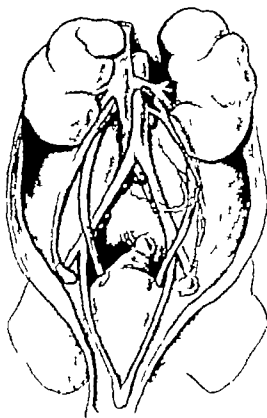


Fig. 2.

Otherwise they pass into the lymph vessels of the kidney.

6. The lymphatic unions between the bladder and kidney are not direct but exist either by the interposition of the regional glands of the bladder and kidney or by means of the lymph-vessels of the ureter.

The vessels of the ureter communicate with the vessel of the kidney and bladder. There are two ways of indirect communication: (1) By way of the hypogastric lymph-glands (from the kidney to the lumbar glands and from the bladder to the hypogastric glands, and the lumbar and hypogastric glands communicate); (2) the lymph vessels of the ureter communicate at the upper and lower parts of the ureter with the vessels of the kidney and bladder.

The vessels of the lower ureter go to regional



Fig. 3.

glands; the bladder lymphatics go to regional glands but these vessels may anastomose before reaching the hypogastric glands.

From the lower ureter the lymph vessels of the lower portion of the ureter can be filled. The single lymph vessels that run lengthwise along the ureter unite with the lymphatics of the kidney and the pelvis of the kidney. Gerota has shown a direct passage of lymphatics of the ureter into those of the bladder.

The lymph vessels are so situated and connected that they offer a favorable means of transmitting infection from the bladder to the kidney especially since they are capable not only of transmitting infection through the walls of the ureter but also through the regional glands, which act as connecting links between the lymphatics of the bladder, ureter and kidney. The accompanying plate (Fig. 2) is reproduced to show the relations of the lymph-channels described by Sakata to the regional glands of the pelvis and the kidney. It is interesting to note that the lymphatics which leave the ureter to go to the regional glands are in connection with the kidney through these glands, while the veins which leave the ureter go as a rule to the veins which empty into the general circulation without reaching the kidney.

Lymphatic infection of the kidney is favored also by the tendency of the lymphatic currents of the ureter to flow upward.

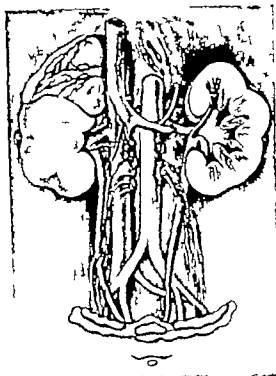


Fig. 4.

Kumita (5) demonstrated superficial and deep lymphatics in the adipose capsule. The superficial lymphatics form a capillary network which drains into a lymph node lying above the renal vein of the corresponding side (Fig. 3). On both sides these lymphatics are connected with those of the diaphragm and on the right side they are also connected with those of the liver. The deep lymphatics form a similar network, and terminate on the right side in a node lying below the exit of the renal vein and to the left of the vena cava. On the left side they empty into a node lying below the renal vein and to the left of the aorta (Figs. 3 and 4).

These deep lymphatics communicate with the superficial lymphatics and those of the fibrous capsule.

In the dog the external layer of the fibrous capsule has a capillary network of lymphatics communicating with the deep lymphatics of the adipose capsule and the lymphatics of the internal layer of the capsule. The latter has a capillary network of lymph vessels which



Fig. 5.

communicate with those of the external layer of the capsule and empty into the lymphatics of the cortex of the kidney.

In the human being a similar communication takes place between the lymphatics of the adipose capsule and those of the kidney. Lymph-spaces which communicate with the capsule of the kidney are found under the capsule.

The lymphatics pass from the cortex to Bowman's capsule, form a capillary network in the glomeruli, and from here pass along the loops of Henle and the collecting tubules, surrounding them as they go. They make their exits at the hilum going to the regional glands. The lymphatics of the ovary empty directly into the lymph-nodes at the kidney (Fig. 4).

References to the work of others on the lymphatics of the kidneys will be found in the work of Kumita. Figs. 3 and 4 are from Kumita's work, and are reproduced here to point out to the thinking surgeon the intimate relationships between the lymph system of the entire abdominal cavity and that of the kidney. Let us therefore not conclude that a paranephritic abscess is hematogenous until the possibility of a primary focus in gall-bladder or appendix or somewhere in the pelvis has been ruled out.

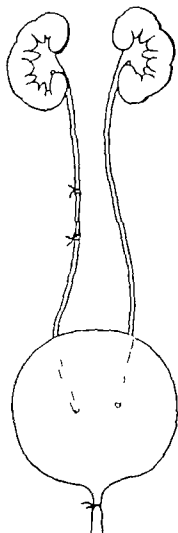


FIG. 6

It will be noted that neither Sakata nor Kumita, whose work represents the best we have to their time, were able to demonstrate mucous and submucous channels. Bauereisen (6) undertook this study and succeeded in demonstrating a rich network of lymphatics as seen in the accompanying reproduction of one of his plates (Fig. 5). There seems, therefore, no reason for disagreeing with Bauereisen, that the kidneys and the bladder therefore, stand in much closer relation to one another through the lym-

phatics of the ureter than one has heretofore supposed. I think I may declare that the kidney can be reached from the bladder by pathogenic organisms more easily by way of the lymphatics than intra ureterally. No exception can be taken to his final paragraph.

We are far removed from the view that every pyelitis and pyelonephritis is of lymphogenic origin, but we do believe from the final demonstration that the mucosa, submucosa muscularis and adventitia of the human ureter are provided with a great connected lymphatic network that we have placed in the right light a previously hardly even mentioned path for the infection of the kidney, ureter and bladder. We are convinced that the intra ureteral path for an infection of the kidney by any pathogenic organism whatever, instead of the lymphatic path, has been overestimated. Certain cases of disease of the urinary tract can only be explained by the extension by way of the lymphatics. Even the hematogenous path for many cases must be excluded in favor of the lymphatic extension.

Bauereisen's injections did not bring out the network over long segments of the ureter but are clearly seen in the cross sections of the tissue. If we now mentally add to the accompanying plates from Kumita's work (Figs. 3 and 4) an extended intercommunicating network in the mucosa and submucosa, the possibility of the extension of infection along the lymphatics needs no further demonstration to the surgeon familiar with the rôle of the lymphatic system in other parts of the body in the spread of infectious processes. It is to be regretted that our knowledge of the physiology of the lymph apparatus, its purpose, the direction of the flow of the lymph, and so forth, is not equally clear.

The anatomical demonstration of the existence of the lymphatics being thus offered, the definite demonstration that this system is indeed most concerned and that the intra ureteral pathway for the ascent of the infection should be given up, can be accomplished in two ways — by the study of the pathological anatomy and by the direct experimental proof. Sugimura (7) has followed the former method in a paper published since the ap-

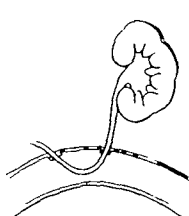


Fig. 7

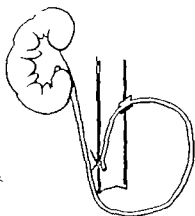


Fig. 8

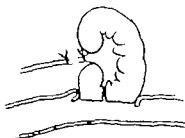


Fig. 9

pearance of Stewart's work drawing the following conclusions from a study of the material from 21 autopsies:

First The ureters, especially the lower third including the intramural portion, are almost constantly more or less involved in acute cystitis with apparently unchanged ureteral orifices by way of the lymphatics of the ureter.

Second At the same time, one can find only traces of inflammation on the mucosa of the ureters; no continuous ascent of infection on the mucosa from the ureteral orifices can be demonstrated. This agrees with the already known fact that the ureteral mucosa is oftentimes very little involved in simple ascending infection of the upper urinary tract.

Third It is remarkable that in acute cystitis many areas of infiltration appear in the lower segment of the ureter in the lymph tracts of the muscularis and adventitia, and also of the submucosa. They are in the intramural portion of the ureter in relation with the lymphatics of the neighboring muscular coat of the bladder and further with the lymphatics of the corresponding bladder mucosa. From this fact it may be concluded that the acute cystitis as such does not remain limited to the bladder wall but ascends more or less toward the kidney through the lymphatics of the ureter.

Fourth The ascent of the acute inflammation of the bladder through the lymphatics of the ureter toward the kidneys, which has up to this time never been described, seems

to differ according to the kind and virulence of the organism producing the inflammation, the duration of the disease, and the anatomical change of the bladder wall. It seems probable to me that the ascent goes about parallel to the anatomical change of the inflamed bladder wall.

Fifth Also in the chronic, non-specific inflammation of the bladder with or without retention of urine and also in the so-called simple descending infection of the upper urinary tract, the involvement of the lymphatics of the ureters can be clearly demonstrated. Although the mucosa of the ureter seems more extensively involved in the acute descending infection, the suspicion nevertheless lies close at hand that the lymph tracts of the ureter play an important rôle in the extension of the acute inflammation of the bladder and kidneys.

Sixth The inflammation can further with intact ureter spring from the bladder to the kidney pelvis intra-ureterally as has been described before.

We are inclined to accept Sugimura's findings, with the exception of the statement in his fourth conclusion that no one has described this lymphatic extension of the infection before him and concerning his last conclusion we shall present evidence which would seem to throw doubt upon the likelihood of infection entering the kidney through the intact mucosa of the kidney pelvis.

Our own work has been conducted chiefly along the lines of the experimental method

using the technique of pathological study in suitable cases. We have from the nature of our problem had constantly in mind the possibility of the successful anastomosis of the ureters with the bowel, and have in this way often obtained results of extreme interest to the fundamental question of the rôle of the lymphatics. Our work has been directed toward the condition so common in surgical practice, of the involvement of the trigonum and the intramural portion of the ureter and therefore all of our experiments have been made with the object of anastomosing the ureter itself with the bowel.

That the infection can be demonstrated in the lymphatics is shown by the following line of experimentation, similar to that adopted by Bauerleien and Sugimura, of which the following experiment may serve as an example.

CASE 43, December 30, 1911. Both ureters were isolated for short distance in their mid-portions and anastomosed with the sigmoid by passing each ureter through a needle puncture of the mucosa and fastening them in place by suturing the denuded surface of the ureter to the muscularis and serous coat of the bowel. January 7, 1912 the dog died. The ureters within the lumen of the intestine were gangrenous in appearance, quite large and seemed to be covered with a membrane. Above this the ureters appeared normal, though they were constricted at the point where they entered the bowel. The pelvis of both kidneys was covered with a thin bloody membrane.

Microscopic examination of the left ureter and kidney. S. 37070, 20. Left ureter, portion lying within the lumen of the bowel. The mucosa and submucosa are normal. The muscular coat shows some engorgement of blood sinuses. The adventitious tissue is necrotic and infiltrated with many pus cells in its peripheral portion. This process subsides as the muscularis is approached.

No. 6. Left ureter near where it enters the gut. The mucosa is normal. In several areas beneath the mucosa there is an increase in submucous cellular elements. The submucosa shows some engorgement of its blood sinuses. The muscularis is normal. Beyond it are several small focal collections of pus cells. In the periureteral tissue are collections of pus cells, with accompanying congestion of the blood-vessels.

No. 7. Left ureter midway between kidney and intestine. The lumen contains some pus. The mucosa is normal and submucosa is in one area infiltrated with pus cells, small round and spindle cells. The muscularis beneath this shows less infiltration but vascular engorgement in addition.

Most of the vessels of the adventitia show thrombosis. Periureteral tissue is that described in No. 6.

No. 15. Ureter at pelvis, kidney sinus, and adjacent kidney. The lower portion of the ureter is normal. The periureteral tissues show necrotic areas infiltrated with pus cells. Aside from this the tissue is fairly generally infiltrated with pus cells. As the kidney capsule is approached from this region, vascular thrombosis is evident and the infiltration with pus cells is less marked. This infiltration, however, extends into the cortical tissue of the kidney. The periureteral infiltration becomes much less marked as the ureter is ascended but a bit higher there is marked necrosis of the ureter and infiltration with pus cells with involvement of the mucosa at this point and pus in the lumen of the ureter. This process extends into the alveolar tissue of the kidney sinus.

Such an experiment leaves no doubt that the micro-organisms are in the lymph-spaces, but the presence of pus in the lumen of the ureter makes it appear possible that the infection has broken into the lymph-spaces from the lumen of the ureter. Suppose then that we break the continuity of the lymphatic system but leave the channel of the ureter free and even, for an extent, held open as in the following experiment.

CASE 10, October 9, 1911. The mid-portion of the right ureter was isolated and 3/4 cm. excised (Fig. 6). A piece of rubber tubing of approximately the same size as the ureter substituted by telescoping it into the two ends of the ureter and fastening the ureter to the tube. The urethra was exposed, ligated in two places, and severed. A bouillon culture of virulent colon bacilli was then injected into the bladder. Death occurred in 48 hours. Autopsy shows some pelvic peritonitis and the peritoneal surface of the bladder was markedly inflamed. The left kidney was much larger than its fellow. Its cortex showed hemorrhagic areas, and the ureter was markedly inflamed. There were signs of inflammation of the right ureter from the bladder to the region of the rubber tubing. The right kidney appeared normal.

It will be noted that a motile organism was used and urinary retention produced yet the infection on the operated side apparently extended only so far as the lymphatic system was intact. It is evident that the duration of the condition would have a bearing upon this experiment. Had the animal lived longer the infection might have traveled along the outside of the rubber tubing and have entered the lymphatics above the tubing. Nevertheless, this fortunate experiment

showed that the infection of the bladder with motile organisms and in the presence of urinary retention does not travel upward through the lumen of the ureter. Suppose now this experiment be reversed — the ureter is placed in contact with infectious agents which cannot enter the lumen of the ureter and we find the usual picture of an ascending infection, results departing in no way from the picture seen after transplanting the open end of the ureter into the bowel.

The following may serve as an example of this line of experimentation, and the result was the same in three other experiments. In one experiment the kidneys showed no infection.

CASE 4, December 7, 1910. Both ureters were freed from the surrounding tissue for the greater part of their course and dropped into the lumen of the sigmoid through separate incisions, 4 to 6 cm. in length (Fig. 7). The bowel was closed carefully over the ureter and care was taken that the ureter should not be unnecessarily constricted at the points of entrance into and exit from the bowel. The normal course of the ureter to the bladder was not otherwise disturbed, and the urine followed its normal path into the bladder. Death occurred December 7th. Autopsy showed the incisions into the bowel to be nicely healed, and the intra-intestinal portion of the ureter intact although much enlarged, both kidneys showed hydronephrosis and pyonephrosis, the usual picture of ascending infection. Three other cases showed entirely similar results, one case showed no sign of infection of the kidney.

In this case it is evident that the infection must have reached the kidney through some other channel than the lumen of the ureter unless of course it might be supposed that the infection had traveled through the ureter into its lumen in the intra-intestinal portion of the ureter but the normal appearance of the mucosa of this intra-intestinal portion of the ureter excludes this assumption.

That the infection does not proceed by way of the lumen of the ureter is also proven by the following experiment, which also proves our contention that the actual source of the infection lies in the infected wound of the bowel wall. The bacteria which are not especially virulent in the intestinal content, become virulent when growing on the cut edge of the bowel, and thence pass into the lymphatics.

Before recording the following experiment,

the conclusion reached by Stewart in his earlier paper should be recalled, that the level at which the anastomosis is made has no influence on the resultant infection. In this series of experiments anastomosis was made at several levels from the duodenum to the sigmoid, without change in the results.

CASE 40, December 10, 91. The right ureter was isolated and severed close to the bladder and the free upper end passed through the lumen of the greater pancreatic duct into the bowel (Fig. 8). The left kidney was removed. Autopsy December 3d, showed good healing at the site of entrance of the ureter into the duodenum. There were no signs of hydronephrosis or hydro-ureter nor were there any signs of infection of the kidney.

Microscopic sections of the right kidney showed much engorgement of its blood-channels, but no evidence of infection.

Seven cases similar to this were done in some nephrectomy of the left kidney was done at a later date in one, the pancreatic duct was transplanted into the appendix, and the ureter was passed through it at a later date. In none of these seven cases was there evidence of infection of the kidney. In some there was distinct evidence of obstruction and in all of them death resulted. This operation is made possible in the dog by the fact that the dog possesses at least two pancreatic ducts both of which are separate from the bile duct.

In these experiments we see that even in the presence of obstruction to urinary flow with the lumen of the ureter opening into an infected cavity no ascending infection occurs if the lymphatic channels are not in contact with virulent organisms. It might be objected that, since the content of the duodenum is not particularly virulent no infection resulted, and therefore the lumen of the ureter cannot be excluded as a pathway.

Any final belief that the infection really proceeds upward by any other path than the lymphatics must be forsaken in view of the following experiment.

CASE 46 January 14, 1913. The right kidney was exposed, and its ureter ligated in two places near the pelvis of the kidney and cut between the lower pole of the kidney was then incised until the pelvis of the kidney was reached (Fig. 9). Hemorrhage was controlled by radial sutures passed through the opening into the pelvis to the circumference of the

cut edge of the kidney. The duodenum was then opened and anastomosed with the kidney at the site of the opening into the kidney pelvis, by inverting the cut edges of the duodenum and fastening its serosa to the capsule of the kidney with fine Lambert sutures.

February 11th, the animal was in good condition, and was killed with gas. At autopsy the left kidney and peritoneal cavity appeared normal; the right kidney was covered with omentum and showed duodenum attached. The right kidney and intestine were opened; the kidney appeared as normal as its fellow except that the pelvis mucosa was covered with dirty mucus. Microscopic examination of the right kidney showed some small abscesses between the lower pole and the gut, with some necrosis and reactionary infiltration in the lower pole. In isolated areas confined to the lower pole of the kidney were areas of cellular infiltration; the mucosa of the pelvis was generally free from infection, though in areas there was submucous infiltration with small round and epithelial cells. The upper pole of the kidney is not involved.

Eleven operations similar to this were done, various segments of the intestine from the duodenum to the sigmoid being chosen as the site of the anastomosis. In two instances both kidneys were treated the same way. In but one of all these operations was the resulting kidney infection general. In those in which the opposite kidney had been removed the kidney which had been anastomosed with the intestine showed at autopsy compensatory hypertrophy. The mucosa of this kidney appeared perfectly normal, even in one instance where there was a slight hydronephrosis. If however the opening into the bowel closes later as has happened in several instances in which the opposite kidney had been left intact, and which are not included in these eleven cases, a general kidney involvement may occur. That this should occur seems self-evident, since an infection enclosed in any body cavity will naturally spread. This condition is entirely comparable to Banerisen's results, where general renal tuberculosis followed marked stenosis or complete obstruction of the ureter.

In regard to the ascending hematogenous infection, Stewart concluded that, though infection of the kidney would seem to be possible through the ureteral blood vessels, it must be decidedly rare, since the veins of the ureter tend to empty into the neighboring veins rather than to drain toward the kidney.

Should the veins of the ureter happen to carry infection toward the kidney the venous flow coming from the kidney would tend to withhold the kidney infection from the ureteral veins that empty into the kidney veins. However progressive venous thrombosis would permit infection to reach the kidney.

Our further consideration of the subject of hematogenous kidney infection during our work since the publication of Stewart's paper leads us to a still more decided conviction that the theory of the hematogenous infection of the kidney through the veins of the ureter does not explain the acute infections following the transplantation of the ureter into the intestine. While the facts so familiar to the experimental bacteriologist, of the results following inoculations into the blood-stream of organisms of low virulence, prove that strictly localized infections can follow such inoculations, and, therefore prove the possibility of hematogenous kidney infection from foci outside the genito-urinary tract, we still hold that the spread of the infection, once entered the genito-urinary tract, is entirely lymphatic. Our suspicion is, further more, very strong that the post-operative infections of the kidney such as those described in the recent paper by Furniss (8) are likewise transmitted by the lymph system to the kidney.

It might seem to make little difference in a practical way whether the infection had proceeded to the kidney by way of the blood-stream or by way of the lymph stream; the misfortune has occurred, and the kidney must be treated. Indeed if we hold to the hematogenous theory such treatment is all we can do. But if we are to conclude that the infection is lymphogenic, then we must find the primary focus and treat that as well as the kidney lesion.

From the anatomical, pathological, and experimental evidence offered in the foregoing pages, it would seem justifiable to conclude:

1. That an extensive network of lymph-vessels and channels exists in the mucosa and submucosa, in the external coats of the bladder and the ureters, and in the entire structure of the kidney. This network in the

ureter anastomoses freely with the lymphatics of the bladder at the one end, and with the lymph apparatus of the kidney at the other end.

2 That an ascending infection travels through this lymphatic system, not through the blood vessels of the ureter nor through the lumen of the ureter. (a) The blood vessels can be excluded because the veins of the bladder and the veins of the ureter for the greater part, open into the general venous system not into the venous system of the kidney. (b) The lumen of the ureter can be excluded because if the lumen be open to infection the infectious process is traceable in the lymphatic system, not along the mucosa of the ureter. If the lumen be closed to infection the process extends to the kidney in the usual way. If the lumen be open to infection, but the lymphatics not in contact with virulent infection as when the ureter is passed through the pancreatic duct, there is no ascending infection. If the lumen be open, but the continuity of the lymphatics be interrupted infection does not ascend and finally if the kidney pelvis be directly connected with the gut the general infection, characteristic of an ascending infection of the kidney, does not occur.

From the point of view of the practical surgeon it would seem that these results would be of service in the consideration of the possibilities of any infectious process involving the lower genito-urinary tract or

the pelvic organs in general certainly the cystoscopist must transfer his attention from the general question of cystitis to the particular one of the local lesions caused by the cystitis their extent and location. The possibility of the effective local treatment of ulcerated processes of the bladder is also suggestive.

The results of this work upon the general question of the anastomosis of the ureters with the bowel would not seem to hold out much promise. In our hands, at least, every attempt thus far has been blocked by the ease and rapidity with which the infection enters the lymphatic system of the ureter.

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DENTAL DISORDERS AND PERIDONTAL INFECTIONS THEIR RELATION TO NEIGHBORING ORGANS

By V. P. BLAIR, A. M. M. D. F. A. C. S. SUNT LOUIS

AS "Necessity is the mother of invention" so also is it the chief stimulus to association. It is the somewhat tardy general recognition of the interdependence of dental and general pathology that bids fair to be the link that will restore dentistry to its proper relation to general medicine from which it was formerly divorced in the founding of the first independent dental college in Baltimore in 1819 (33). While this separation has undoubtedly been a great stimulus to the development of mechanical dentistry it has none the less been responsible for the fact that in the treating of the teeth great technical skill is often exercised without due regard to the extent and exact nature of the lesion. The most perfect filling of the roots of a devitalized tooth will in many instances but serve to hide pre-existing damage to the peridental tissues.

It is now recognized that the clinical manifestations of disease that we classify are in most cases the direct or indirect results of infections that gained entrance to or were harbored in some particular organ or part of the body. Next to prophylaxis the most perfect form of medical practice is that which seeks to eliminate disease before it has done more than purely local damage. In pursuance of this the appendix, the urethra, the kidneys, the skin and the tonsils have been recognized as important primary or intermediary foci of infection.

But while it has long been known that the mouth is the most prolific of all still it is only somewhat lately that oral sepsis began to receive the attention that it deserves (81-82). Exclusive of the tonsils it is the teeth and their immediate root coverings that here furnish the great area of infection that menace every tissue and structure in the body. In this connection there are three distinct routes by which infection may enter through the open pulp canal through a diseased peridental membrane, and through

injuries to surrounding tissues (the cheeks or tongue) by the sharp edges of carious crowns and roots (17-72). Except in older people, where chronic mechanical irritation by a jagged stump may be followed by cancer the latter injuries are comparatively negligible.

In infection and gradual destruction of the peridental membrane, and with it a partial necrosis of the alveolar bone, we have the much exploited "pyorrhea alveolaris." A destruction of the peridental membrane of all of the teeth to a depth of one-eighth inch from the gingival border will leave an exposed, chronically suppurating surface of from two and one half to three square inches (39) from which not only are toxins absorbed by the granulations but most of the exuding pus is swallowed. Judged from its dire result the most important of all is the infection of periapical tissues resulting from dental caries. Pyorrhea alveolaris in an advanced form is not a common affection, and is limited almost exclusively to adult life while dental caries is the most common affliction of civilized races, hardly five per cent being exempt. Being common in the youngest children, it exposes their tissues to direct and continuous infection while their acquired immunities are nil or are very feeble.

After a caries has penetrated into the pulp chamber there is an open avenue to the vascular tissues about the apex of the tooth, and thence through the blood and lymph streams, and possibly the nerves to all of the body tissues. Pathogenic organisms lodged and incubating within the pulp chamber and root canals may thus be disseminated. If through this source there occurs a low grade septic infection of the periapical tissues, this may be followed by a gradual absorption of bone in the immediate neighborhood, giving rise to a chronic bone abscess. This may persist for years, causing few or no evident local symptoms, and for this reason be the greater menace.

Chronic blind alveolar abscesses follow a very large percentage of dental work that is apparently mechanically perfect. Gilmer (79) places 25 per cent as a safe estimate of the number of jaws that contain suppurating cavities. To my mind this prevalence of the disease might throw a doubt upon its seriousness but I believe that at present we are not in a position to accept such a conclusion, and I have heard Gilmer make the statement that he was of the opinion that possibly every dentist of large practice was a direct or indirect cause of the death of one or more persons yearly through permitting chronic alveolar abscess to go on indefinitely without being cured, since we are in possession of the facts regarding the various serious liabilities which we can definitely trace to chronic alveolar abscess. Failure to clean out certain tortuous root canals may be dependent not upon the lack of proper operative skill but because the impossible is attempted (26). The periodontal membrane is somewhat elastic and during mastication a pressure of from 10 to 250 pounds may be brought to bear on a single tooth (39) as a result, a root that extends into an abscess acts as a plunger that tends to force the pus into the lymph-spaces or into any damaged vessel in the abscess wall. The gradual absorption of bone around a periodontal abscess may continue until the abscess attains relatively immense proportions, with corresponding destruction of the jaw bone and in the upper jaw the maxillary antrum may be directly invaded giving rise to a submucous or intramucous antral empyema (18 30 33). The percentage of antral empyemas that are credited to dental infections is variously estimated up as high as fifty.

Based upon observation made during eighteen years as demonstrator of anatomy in the dissecting room it is my belief that infection of the antral mucosa of dental origin is rather rare, but that infection and suppuration in the submucosa are exceedingly common. The condition here referred to may be compared to a gum-boil within the month. The alveolar mucous membrane is red and swollen when there is a submucous abscess, but this cannot be designated as a true antral

empyema. I have seen a great many of these submucous antral abscesses in the dissecting room some of them so large that half of the antral cavity was obliterated but I have rarely observed a true antral empyema. It is easily understood how in such a case, the dentist cleaning a root canal might puncture the mucosa and open into the antrum.

As the result of local irritation the epithelium of dental rests may be stimulated into activity giving rise to the true dental cyst, equally destructive to the bone and which may also invade the antrum. As many of the so-called odontomata are believed to be of inflammatory origin, these too must be included with the other results of periodontal infection, but it is possible that this infection might be metastatic. An infected cyst or the abscess cavity about a root or a sequestrum may cause a chronic fistula opening either within the mouth, maxillary antrum, nasal fossa or externally. Premature loss of the teeth may cause deformity of the jaw-bones and of the bones of the face and skull (31 32). The purely local effects of periodontal infection are not always of this chronic character. They may be extremely acute and very extensive going to an acute alveolar abscess, necrosis, cellulitis or diffuse suppuration. In this connection it is well to bear in mind that in the presence of certain chronic toxemias such as mercury bismuth, phosphorus, and syphilis, periodontal infections are prone to light up widespread local destructions (35 37 39). Local cellulitis is usually first manifested in the oral soft tissue but may spread directly to the neck or to any of the facial or cranial tissues or may be first manifest in the neck as a peridontitis. Two forms of cellulitis of the neck are worthy of special mention one, the chronic Holzphlegmon, three cases of which we have observed to be of dental origin and the so-called Ludwig's angina, which latter when not promptly and properly treated in the past has been credited with a death rate of 40 per cent. Of nine cases of Ludwig's angina which we have seen four were unquestionably due to dental sepsis, while but two were clearly due to some other cause (61 63 22 23 27 48).

Cervical adenitis of dental origin is commonly either septic or tubercular the latter being the more important. Moorehead (15 80) cites Odenthal, who, in examining 978 children between four and thirteen years found that 429 had progressive caries of the teeth. In 217 of the children the caries was advanced and in these glandular enlargement was more pronounced. In 70 there were other lesions that might account for the lymphangitis. In 359 cases no other cause could be ascribed. In 131 of these the caries was one-sided only and in all of the cases the glandular enlargement was on the same side. He also found that 99 per cent of children with abscessed teeth had enlarged cervical lymph-nodes while they were found in only 49 per cent of children with sound teeth.

Hugo Stark (40) found in 13 children with chronically enlarged cervical lymph nodes, that 80 per cent had carious teeth, and in 41 per cent of this 80 per cent no other cause, not even heredity could account for the lymphangitis. The tubercle bacillus is frequently present in the mouths of non tubercular subjects (78).

Tubercular adenitis has been produced experimentally by infecting the dental pulp. In a few cases of tubercular adenitis the tubercle bacillus was found in a carious tooth corresponding to the infected node (9 17 10, 11 12 13 14 15 34, 47 68 69 70). Before leaving this region it should be noted that carious teeth are probably a frequent port of entry of the mycoses (63 19 24).

We have seen three cases of sarcoma or malignant endothelioma and one of Hodgkin's disease—beginning in the cervical lymphatics apparently engrafted upon an acute septic adenitis of dental origin. All four cases died of generalization of the disease.

The tonsils have been proven to be one of the great primary foci of infection they in turn must be affected by septic material from the teeth as is the mucosa of the mouth, pharynx, and larynx (6 7 64, 20 29 18 21 48 79). G. S. Wright (46) has observed that during the eruption of the molar teeth at two, six, twelve and seventeen years there is a sympathetic enlargement of

the tonsils that subsides with each dentition.

Engman was about the first in this country to point out the relation between dental affections and certain mucous and skin lesions—some by direct infection, others through reflex nerve irritation (76 77 41 56 57 58 59, 60).

Sympathetic spasm of the muscles of mastication is a common accompaniment of dental irritation. To a less degree this affects the pharyngeal muscles. We have observed two cases of torticollis with early scoliosis that were relieved by opening an alveolar abscess in each (61).

Whether epidemic parotitis is ever in any way dependent upon caries is not known, but it is now recognized that the so-called metastatic or secondary parotitis is directly dependent on oral sepsis travelling up the excretory duct, and we have been able to express pus from Stenson's ducts before any suppuration was evident in the glands (6, 65 72). As previously stated, premature loss of the teeth may change the shape of the jaws and also secondarily the nasal chambers. Langworthy (20) has cited irregular eruption of the teeth as a cause of nasal spurs and deviation of the septum. Certain it is that savage races who are relatively immune from dental caries are almost equally free from septal deviations. Nasal obstruction may itself be a cause for oral sepsis and dental caries. The temporomandibular joint may as any other neighboring structure be involved in an extensive inflammation arising about a tooth, but this is probably of rare occurrence. Out of 197 cases of ankylosis of the jaw which we have been able to gather from the literature in only five was infection of the teeth given as a cause. In 2 cases of our own two were due to scar bands in the cheek due to intra-oral slough, but a dental origin of the sloughing could only be inferred. The cause given was mercurial salivation, but mercurial salivation, like stomatitis and the oral manifestations of scurvy are practically unknown in the absence of teeth. Like any other joint, the temporomandibular may be indirectly affected by chronic suppuration in any part of

the body (48) In the instances already enumerated the disturbances in neighboring organs were the direct result of infection spreading from the teeth or of tissue changes due to the subsequent loss of the teeth When however we turn to review the eye ear and nervous system in their relation to diseased teeth we find that at present many of the phenomena can be explained only as reflex irritation (5) In regard to reflex irritation, we must include certain causative factors which are not infections but in many instances are the result of infection These are chiefly irregular eruption of the teeth mal-occlusion, impacted teeth, and rough or poorly fitting bridges and fillings

In 273 cases of baldness Jacquet noted that 185 occurred during the tooth erupting period but very few occurred between 15 and 19 years He cites one case of right occipito-nuclear baldness in a male of 36 years which was completely relieved after dental treatment The view that baldness may be dependent upon dental disorders is strongly supported by the French (7 41 56 57 58 59 60)

In reviewing the literature one finds hints here and there of orbital infection of dental origin, supposed to have traveled upward through the pterygoid or antral plexus of veins (2 4, 6 18 24 29 67) these may be accompanied by a case report Ocular disturbances supposed to be referable to dental disease through reflex irritation seem to be more common It may be possible that the term eye teeth arose from some such supposition, but it is the opinion of most writers on the subject that the cuspids bear no particular relation to the eye that it is the second and third molars which are more frequently responsible for ocular disturbances Frick in 1826 remarked that strabismus was often concomitant with difficult dentition (73) In 1870 Delestra published several cases of visual disturbance related to extraction (73) Herman Schmidt (76) examined the eyes of 92 patients with dental disease and in 73 of these accommodation was lower on the diseased side, while in 19 it was not affected Cases of blepharospasm exophthalmia, amaurosis, retinal hemorrhage, persistent eye fatigue neuralgia of the eye

reduced vision, and other ocular disturbances (73 25 38 75) have been reported under circumstances which leave little doubt of their association with dental disorders but they cannot be common In this connection, I spoke to an oculist who has had large opportunities for observation and who is conceded to be an excellent clinician He said that he had examined probably 60 000 cases of eye or orbital troubles, and that he did not remember having seen a single one in which an eye disturbance was directly traceable to a tooth lesion It may be that the routine of the alveolar process with the X ray or the Gilmer sharp alveolar probe in mouths that contain root fillings will throw more light on this subject

Through continuity of the mucous lining of the mouth pharynx, eustachian tube, and middle ear infection may travel from one to another but aside from the well-known fact that pain from a tooth irritation may be felt in the ear little is known of any direct connection between peridental infection and ear disease While children are cutting teeth they frequently have earache, and we have seen such an earache relieved by instilling a cocaine solution into the external ear in cases where there was no suppuration of the tympanic cavity In these cases the pain may have been due to congestion of the tympanum in common with that of the other mucous membranes (6 20)

That headache may be due to peridental infection is well known to every clinical observer we have seen persistent severe headache lasting for months which was relieved by opening a blind apical abscess in an apparently perfectly clean mouth with no local dental symptoms Extraction of an impacted molar has had a similar effect (18 27)

Each primary division of the fifth nerve sends off recurrent meningeal branches and according to Head, the dental nerves have definite reflex areas due to the innervation of these areas coming from two sources For instance a caries of an upper incisor may cause pain or some other reflex manifestation over the frontonasal area Caries of an upper bicuspid may cause a reflex dis-

turbance over the temple of the same side. An irritation of a tooth insufficient to produce a pain may cause a muscular twitching. The pain of an irritated molar pulp is one often generalised over that division of the fifth nerve as located in the diseased tooth. Sluder has called attention to the fact that an irritation of the sphenopalatine ganglion from an infected ethmoid cell causes pain over the first and second divisions and over the occiput, which radiates down the neck and arm and even to the leg of that side. We have seen the same thing occur from a blind abscess of a first upper molar (4, 18, 21, 20, 27).

In 94 cases of tic douloureux which we have examined the origin of the pain seems to have been definitely related to a dental or a peridental irritation in 26 and in 35 out of the 94 the pain began in the third division of the nerve. Of the nervous, mental, and psychic disturbances that have been found to be dependent upon dental disorders, much has been written and much convincing evidence has been put forth in specific instances but to present more than a few suggestive cases would take us far into the neurologic field for as Troemner puts it, all disturbances of the peripheral and central nervous system must be included in consideration of the neurology of the teeth.

Skiagraphic study of the teeth in 350 neurologic patients with dental disease convinced Upson (46) that in many of them the dental disease was causal rather than causal and he observed that in 58 cases of mental derangement 30 had impacted teeth (48) and that in 22 of 28 cases of mental derangement operated upon, definite improvement took place within two weeks after operation (45). We have also observed similar instances, and in examining cases of epilepsy that are sent to us for operation we pay particular attention to the condition of the teeth. Goldman (62) describes the case of his 6 year-old daughter who, without determinable cause began sleep-walking. An enlarged submaxillary node directed attention to the second lower molar which had been filled six months previously. Removal of the filling showed a concealed caries. The tooth was extracted

and the child slept quietly. Holmes (16) cites the case of a boy who became morally delinquent. It was found that some of his first teeth were unerupted and others not yet shed. Treatment of the teeth produced marked improvement in his moral condition. Upson (43) cites two cases of irritability and backwardness at school and of defective mentality cured by dental operations. In 1846 Esquirol (46) described three cases of insanity cured by dental treatment. Many such instances could be quoted, and Kron has in his treatise a bibliography of 248 references on this subject.

In this paper in pursuance of the title, mention of complications other than affections of neighboring organs has been assiduously avoided but, as claimed in the beginning, there is no organ or tissue in the whole body that may not be at the mercy of infection that gains entrance through or around the teeth.

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PRIMARY CARCINOMA OF THE LIVER IN CHILDHOOD

WITH REPORT OF A CASE

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PRIMARY carcinoma of the liver at any age is a rare condition. In White (43) observations in 11,500 autopsies 11 were noted. Virchow noted 5 cases in 6000 autopsies. Before Virchow's differentiation of primary and secondary carcinoma, practically all cancers of the liver were classed as primary. But observations since then have shown primary cancer to be rare indeed. It has been estimated that the proportion of undoubtedly primary to secondary carcinoma of the liver is as 1:5 (White).

As to age incidence Hanot and Gilbert (44) say: Primary cancer of the liver presents its maximum frequency from 40 to 48, is rare from 30 to 40, and is exceptional under 30. White states that hepatic cancer is all but unknown under 30.

A number of splendid reports are in the literature on carcinoma of the liver. Hanot and Gilbert report 24 cases, none of which occurred in childhood. However they cite two cases previously reported: one by Deschamps (14) in a boy aged 11 years, and one by Wulfi (19) in a child aged 3. Eggel (46) in a very complete and voluminous report reviews 117 tabulated cases that were microscopically diagnosed. Three cases occurred in childhood: 14 years (Pye Smith (21)), 2 years (Birch Hirschfeld (20)), and 2 months (Pepper (11)). Of 45 additional cases not microscopically diagnosed, but one occurred in childhood: 9 years (Kottmann (18)).

Phillip (47) has contributed a very valuable review on carcinoma of the liver in childhood. He has classified his collaboration under three heads. First, the authentic cases, in which series he has collected 12 cases ranging in age from 14 months to 14 years. Second, the probable cases in which are 10, ranging in age from one day to 14 years. Third, the doubtful cases, in which are classed 7 ranging in age from 3 months to 12 years. He reports no new cases.

Ackland and Dudgeon (23) report 7 cases of primary carcinoma of the liver in childhood collected from the literature as well as their own case which occurred in a boy aged 15.

Karner (32) has contributed to the study of primary carcinoma of the liver two of his cases occurring in childhood—a girl aged 11 years and a boy aged 8. He also discusses the pathological classifications of the liver cancers.

Burt (30) has reported a primary adenocarcinoma of the bile-duct type occurring in a 12-year-old boy.

Peifer (34) in addition to reporting a case of primary carcinoma of the liver in a 9-month-old child discusses the various types of cells that enter into the formation of liver cancers.

Fussell and Kelly (41) report a primary trabeculo-alveolar carcinoma of the liver with cirrhosis occurring in a girl aged 16. This is the oldest case recorded in our tabulation.

The Japanese have made valuable contributions on their observations of primary carcinoma of the liver in childhood. Nagasawa and Nakamura (38) have reported a case in a 17-month-old child. They cite a similar case reported by Miwi and Utsumi (39). Miwi and Saito (40) have reported a primary parenchymatous adenocarcinoma in a girl aged 5 years and 5 months. Idsumi (37) has reported a primary liver carcinoma in an infant of 7 months. In this tumor was also found osteoid tissue. Yamagawa (36) has reported a primary teratoid adenocarcinoma in a girl one year old.

Milne (31) has added a case of simple liver-celled adenoma in a child of 6 months. His illustrations add greatly to the study of epithelial tumors of the liver.

In the article contributed by Munser (45) in the *Cyclopædia of Diseases of Children*, 10 cases of carcinoma of the liver occurring in childhood are tabulated.

Symptoms The symptoms of this condition are as variable as the location, extent, and toxicity of any malignant disease. The cases reported show in general the following

- 1 Cachexia, anemia.
- 2 Gastric or right hypochondriac pain.
- 3 Tumor in abdomen.
- 4 Icterus when bile exits are occluded.
- 5 Ascites when portal or lymphatic obstruction occurs.
- 6 Terminal fever

Nearly all of the deaths were described as being caused by cachexia and asthenia.

Duration This is reported indefinitely from 14 days to one and one half years.

Gross tumor classification Primary carcinoma of the liver is classed under three types (a) nodular (b) massive, (c) diffuse. In our tabulation diffuse is very rare, and three nodular occurred to one massive type. This conclusion is drawn from the cases that are sufficiently described to warrant opinion as to gross characteristics. The size of the tumor is also subject to wide variation. Nodules of all sizes are described. The largest is that described by Ackland and Dudgeon (23) in which case the liver weighed 15 pounds.

Microscopic classification. In general, two classes are noted, simplex and adeno. However the results of analyses of our tabulation will show a very complex record as regards terminology for it must be remembered that several of the cases were reported before accurate microscopic classification was possible.

Metastasis Accurate data regarding metastasis are wanting. In some reports no observations were recorded. In others only the abdomen was explored, thereby making it impossible to state accurately the extent of the disease. However records show that most frequently metastases occurred in the liver and lungs. Some cases showed portal vein invasion.

Review of T. Ishak's Cases. Number 1 cases, 42. Age day to 6 years. Average age 6 years and 4 months. Sex, male 9 female, 4 unclassified as to sex, 9. Metastases in 9 cases, no metastases in 10(?) unclassified as to metastases, 3. Gross classification, nodular type, 4 massive type, 5 diffuse type unclassified as to type, 1. Microscopic classification, adenocarcinoma, 6 carcinoma of the

liver 7 medullary cancer 6 cancer of the liver 6 alveolar carcinoma, 2 adenoma, 2 carcinoma solidum, 1 alveolar cancer scirrhous cancer total, 42.

The case which came under our observation is the massive type of primary parenchymatous adenocarcinoma of the liver.

History P. E., Jr. residence, Slater Missouri. Male child, ten and one-half months old. Normal delivery at term (born May 30, 91).

Family history Parents both American father 35, mother 3. Two other children, both ill and normal. A history of carcinoma in family of mother. Father says that great-grandfather died of carcinoma, aged 80. Absence of specific history in parents. No evidences of tuberculosis.

Personal history Baby was on breast milk from May to December 9, and until November was an unusually robust child. A constipation and no disturbances of digestion until November. At that time he had a cold, and his physician thought that he was having an attack of influenza. A slight cough persisted, and the baby was placed upon artificial feeding. Several foods were tried.

Present trouble At the age of five months the abdomen was quite prominent, but no tumor could be palpated at that time. Since January it has been perceptible that the right side of the abdomen was abnormally prominent. Increasing disturbances of digestion, with persistent tympanites, caused the mother to become alarmed and bring the child to Dr. Frederick M. Lowe of Kansas City.

Examination, April 7, 913. Patient pale and showing considerable emaciation. Abdomen very tense and gas in the bowels causing considerable distress. Emema caused the expulsion of great deal of gas and revealed bulging forward of abdomen on right side. A mass on right side palpable, filling all the space from ribs to inguinal fold. Mass reaches the median line of the abdomen. No fluctuation obtainable. Percussion fails to demonstrate ascending colon over the mass. Auscultation of chest negative, although there has been slight cough persisting for several months. Urine examination shows specific gravity 1.05 and alkaline reaction. There is no albumin nor sugar. Microscopically shows no leucocytes nor erythrocytes, but few coarse hyaline casts along with a heavy deposit of phosphates. A von Pirquet tuberculin test is negative. Baby has been fed on mixture of milk and Mellin Food for months. Some constipation, but stools show no curds. Baby was being overfed and reduction in the amount of proteins produced a marked improvement in digestion.

Notes. The author fully agrees that it is practically impossible to be precise concerning any of the reported cases. However, the list including all the cases that are to be found in the medical literature to which have been added few additional cases. It is pointed out that in the first 17 cases and most of Cases 18 to 29 have been taken from Fisher's report. The author has added Cases 30 to 42 to the table. Different authors have tabulated the other cases in their reports. Obviously, it would appear that the aggregate number should be larger than

TABULATED CASES OF PRIMARY CARCINOMA OF THE LIVER IN CHILDHOOD

Case	Age	Sex	Diagnosis	Author	Publication
	18 mos	F	Medullary cancer of the liver	Oberst	Clin. d. Hög. d. End. 1841, IV 413.
	mos	M	Scirrhus cancer of the liver	Owen	Am. Med. Chir. Rev. 1837 I, 414.
3	6 mos	M	Medullary cancer of the liver	Ch. West	Klinckschmidt 1847 II, 406.
	7 yrs	F	Medullary cancer of the liver	W. Roberts	Lancet, Lond. 1867 I, 77.
4	17 mos	F	Carcinoma of the liver	Adelphi	Trans. Edinb. Obst. Soc. IV
5	mos	M	Liver cancer; cancer of peritoneum	Lichtenstern	Zusammen. Spec. Path. Therap. VII, 331.
	?	M	Liver cancer	Klein	Jahrb. f. Kinderh. W. F. 1853, 53.
8	day	F	Medullary cancer of the liver	E. Meigschick	Deutsche Klin. 1854, VI, 496.
	4 days	F	Alveolar cancer of the liver	H. Walther-Walt	Jahrb. f. Kinderh. 1856, II, 194.
10	7 yrs	M	Medullary cancer of the liver	Le Wan	Zentralbl. f. Kinderh. 1877 73.
	mos.	F	Cancer of the liver	Pepper	Germant's Handb. d. Kinderkrankh. IV 330.
	7 yrs	F	Cancer of the liver	S. Cox	St. Barth. Hosp. Rep. vol. 2, N. 1, Kinder's Den.
13	14 yrs	F	Cystic medullary cancer of the liver	Hemachon	Ref. Jahrb. f. Kinderh. 1865, 1866, 406.
14	17 yrs	M	Cancer of the liver	Deutsche Klin.	La France Méd. 1865, 809.
15	17 yrs	M	Adenocarcinoma of the liver	Benson	Ed. in Bart. 67.
16	10 mos.	F	Atypical liver-celled adenoma	St. Joseph Kinderhospital	Arch. f. Kinderh. 1880, VII, 34.
17	6 mos	F	Cancer of the liver	Bahn	Langenbeck's Chir. der Leber. Callenberg, II, 34.
18	9 yrs.	F	Primary carcinoma of the liver	A. Kettmann	Coe M. d. Schwed. Akad. 1874, Mo. 21, 439.
19	3 yrs.	F	Primary adenocarcinoma of the liver	H. Wolf	Germant's Handb. d. Kinderkrankh. 1879, IV 367.
20	14 yrs	M	Primary adenoma of the liver with carcinoma changes	Roth-Hirschfeld	Germant's Handb. d. Kinderkrankh. 1879, IV 366.
21	14 yrs	M	Primary alveolar carcinoma of liver	Pye-Smith	Lancet, Lond. 1880, 405.
22	14 yrs	F	Primary carcinoma of the liver	Kugelhaush	München med. Wchnsch. 1880, 1716, 457.
23	7 yrs	M	Primary spheroidal-celled carcinoma of the liver	Archard and Dodge	Lancet, Lond. 1906, II, 378.
24	7 yrs	M	Primary carcinoma of the liver	Schlenger	Jahrb. f. Kinderh. 1906 IV 300.
25	10 yrs	F	Primary carcinoma of liver carcinoma	Owen	Deutsche med. Wchnsch. 1906, II, 36, 366.
26	7 yrs	M	Primary adenocarcinoma of the liver	St. Barth. Bart.	Deutsche med. Wchnsch. 1906, II, 36.
27	7 yrs	M	Primary adenocarcinoma of the liver	Mattarolo	Quart. d. Osp., 1905, 4, Jan.
28	14 mos	M	Primary adenocarcinoma of the liver	Plant	Arch. f. Kinderh. 1906, 1716, 30.
29	17 yrs	F	Primary adenocarcinoma of the liver	Lobenz and Philip	Dtsch. f. Kinderh. 1907 366.
30	7 yrs	M	Primary adenocarcinoma of the liver	S. B. Bart.	Post-Operative, 1906, 1716, 301.
31	6 mos	M	Primary adenoma of the liver	Miles	Jour. Path. and Bacteriol., 1906, 116, 313.
32	7 yrs	F	Adenocarcinoma of liver carcinoma	Kanner	Arch. Int. Med. 1911, VII, 173.
33	8 yrs	M	Carcinoma nodulum of the liver	Kanner	Arch. Int. Med. 1911, VII, 173.
34	mos	F	Primary carcinoma of the liver	A. Fisher	Jahrb. f. Kinderh. 1911, 1716, 690.
	8 yrs	M	Primary carcinoma of the liver	La Page	Proc. Roy. Soc. Med. 1911, VI, 1.
36	71	F	Tubercle adenocarcinoma of the liver	Yamaguchi	Fischer's Archiv. 1911, 1716, 437.
37	mos.	F	Primary adenocarcinoma of the liver	Milnes	Arch. f. Klin. Chir. 1911, C, 1181.
38	mos	F	Primary psammomatous adenocarcinoma of the liver	Koprowski and Haskins	Jahrbuch, 1911, Mo. 13—Ref. Dtsch. f. Kinderh. 1911, I, 831.
39	?	F	Similar to case 38	Moss and Utman	Jahrbuch, 1910, Mo. 13—Ref. Dtsch. f. Kinderh. 1911, I, 63.
40	16 yrs	F	Primary psammomatous adenocarcinoma of the liver	Moss and Burt	Jahrbuch, 1911, Mo. 14—Ref. Dtsch. f. Kinderh. 1911, IV 663.
41	16 yrs	F	Primary tubercle-alveolar carcinoma of the liver with carcinoma	Fennell and Kelly	Trans. Am. Ass. Phys., 1897, 2, 106.
42	10 mos	M	Primary adenocarcinoma of the liver	O. L. Castle	

Clinical diagnosis. The tumor seemed a part of the liver but sarcoma of the kidney was deemed more probable. Consent of parents for operation was obtained April 3th. Dr. James N. Jackson was called and operation was done at University Hospital on April 14, 1913.

Operation. Upon opening abdomen, by right rectus incision, a large spheroidal tumor was found growing from anterior margin of right lobe of liver beginning about $3\frac{1}{4}$ cm. to the right of gall bladder and extending about 8 cm. to the right (Fig. 1). The tumor did not encroach greatly upon the liver substance, so that the so-called pedicle varied from 1 to 3 cm. in width. There was a small amount of free normal appearing peritoneal fluid. The tumor dragged the liver down until the bottom of the tumor almost reached the level of the pubes and the left margin extended slightly past the median line. There were a few adhesions posteriorly. There was no evidence of secondary tumors in the liver or elsewhere. The operative technique is outlined in the following: The pedicle in liver was clamped in V-shape with two gastro-enterostomy clamps protected by rubber tubing. The tumor was removed by cutting close to clamps. A roll of gauze was placed to cover cut-surfaces. Then a row of running sutures was placed over gauze and clamps. These sutures were set lightly as clamps were withdrawn. One large vessel required ligature. Then a row of deeper interrupted catgut sutures brought the compressed, gauze-covered surfaces snugly together. This method controlled the hemorrhage very successfully. The laparotomy wound was closed in the usual way leaving the gauze-roll compressed as drainage.

In the literature we have not been able to find a case where there was a surgical excision of a primary adenocarcinoma of the liver in an infant. Some cases have been explored and in others a small portion of the tumor has been removed for microscopic diagnosis. However this case is unique in a complete removal of the tumor by surgical operation.

Post-operative history. The child made a rapid, uneventful surgical convalescence. Temperature did not go over 101. Drains and gauze compress removed on eighth day. Child took nourishment well and gained in weight. Upon the earnest request of the mother she was permitted to take the child home on the fourteenth day after operation. The day after leaving the hospital the child was taken violently with symptoms of acute gastro-enteritis, and after 24 hours death took place. Necropsy was not permitted, although zealously urged.

PATHOLOGICAL REPORT

Gross description. The specimen is an encapsulated globular pear-shaped tumor with prominent dilated blood vessels showing in the capsule. The surface is uneven, due to prominences produced by nodular tumor growths. At its upper pole there is an irregular roughened sickle-shaped area about 5 cm. in length which represents the pedicle attachment to the liver (Fig. 2). The consistency is rather firm the color is reddish brown interspersed here and there with a grayish white nodular area. These colors are not sharply defined, due to the opacity of the capsule. At the pedicle are two more prominent grayish white nodules that bulge under the capsule. The tumor measures 12.5 cm. in perpendicular diameter with corresponding circumference of 35 cm. the horizontal diameter is 10 cm., with corresponding circumference of 31 cm. Weight, 631 grams.

Upon gross section of the tumor through longest diameter and including pedicle, we find that the tumor mass presents a varied appearance toward the capsule are noted more distinct grayish white nodules, while toward the center there are irregular grayish honeycombed masses interspersed here and there with dark red blood-containing areas (Fig. 3). Upon closer inspection the blood is seen to be confined in small multiple cystic spaces separated by a fine whitish web-like tissue. In the upper central part there is a fibrous coloring of olive green bile-stain. This color is not confined to any single area. The capsule is of firm fibrous tissue. Over the anterior surface there is just the capsule covering the growth over the posterior side in addition, there is a thin layer of compressed liver tissue, covered by a thin Glisson's capsule. This liver substance is directly continuous with that of the liver proper. At pedicle attachment it is seen that two grayish nodules have broken through the capsule and are in direct apposition to liver parenchyma. In some of the more extensive grayish white areas mucoid degeneration is evident. In only one large circumscribed nodule is there simple softening and this is not extensive. The blood vessels are not prominent except

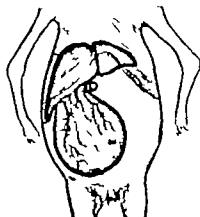


Fig. 2. Gross specimen showing relative size and position of tumor, pedunculated and extending from right lobe of liver past median line and into pelvis.

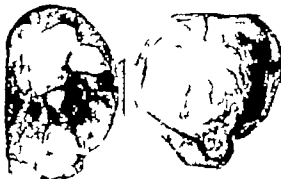


Fig. 2.

Fig. 3.

Fig. 2. Gross tumor with pedicle at top. Note dense fibrous capsule with prominent engorged blood vessels.

Fig. 3. Section of tumor showing spongy appearance of substance due to blood spaces. Large light central areas show softening. Note also where tumor mass has broken through fibrous capsule and has invaded liver substance at pedicle attachment.

in the capsule. There are noted a few small vessels in the intermodular connective tissue.

Microscopic findings. Sections were cut from several areas representative of the variable appearances presented in the gross specimen. Sections stained with Delafield's hematoxylin and eosin, Van Gieson's stain, Weigert's elastica stain, and Sudan III.

Microscopic description. The cells composing the tumor are rather complex (Fig. 4). There is a quite wide variation in size. In some portions the cells are large and spheroidal or polyhedral; in others the cells are smaller and are of low cylindrical or cubic shape. The cytoplasm is finely granular and shows occasional cells containing a very small amount of fat in fine globules. It has not been possible to demonstrate glycogen granules in the cells. For the most part, in the cubical cells, the cell boundaries are sharply defined while in the larger spheroidal type the boundaries are diffuse and poorly differentiated. The large nucleus is centrally placed and is of vesicular type, with a single sharply defined nucleolus. The chromatin has a web-like distribution, radiating from the centrally placed nucleolus. Karyokinesis is occasionally noted. This is most prominent in nodules which have broken through the tumor capsule as is shown in Fig. 5.

The architecture of the tumor is essentially that of a tubular neoplasm (Fig. 6). The cells are arranged in tubules of variable size,

from one or two cell layers in thickness to as many as twenty or more. The central lumen is also of variable size; in some areas not clearly made out while in others appearing as a large cystic space in the section. The contents of the larger spaces show an undetermined granular detritus with a good many

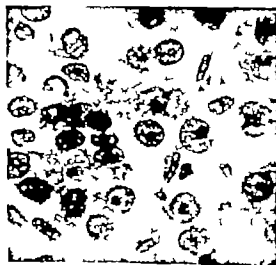


Fig. 4. Photomicrograph (Spencer / Ocular 8X). Section from same area as VII, showing vesicular nucleus with definite nucleolus, the chromatin having weblike distribution. The cells have finely granular cytoplasm. In areas the cell boundaries are very indistinct. There is considerable variation in size. A fine capillary lined by endothelial cells traverses this field.

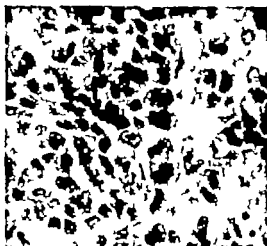


Fig. 5. Photomicrograph (Spencer 6, Ocular 65X). Section taken from the center tumor has broken through capsule showing a trabeculated or alveolar arrangement where the tubules have been cut tangentially. The tubules are separated by an interlocking capillary network lined by flat endothelial cells.

polymorphonuclear leucocytes (Fig. 7). In some area the tissue has a trabeculated or alveolar arrangement where the tubules have been cut tangentially. The tubules are separated by an interlocking capillary network lined by flat endothelial cells. In the gravest part of the capillaries show occasional microscopic dilatation where it is seen that the lumen is filled with blood. In sections taken from the red, spongy areas it is found that the blood is not a hemorrhage but is confined in enormous dilatations of these intertubular capillaries. Many polymorphonuclear leucocytes are confined in the blood clot.

Blood vessels are not prominent except in the firm fibrous capsule which is not differentiated from the capsule of the liver except at the pedicle attachment. There is noted in sections taken from the centers of the large grayish area a simple parenchymatous degeneration. Near these areas the fatty droplet in cell are plentiful. In some portions there is moderate mucoid degeneration. Weigert elastic stain shows a lack of elastic fibrils except in the blood vessel and in the perivascular connective tissue. Van Gieson stain shows the connective tissue fibrils in the intertubular capillaries.

In a neoplasm of this nature the considera-



Fig. 6. Photomicrograph (Spencer 7.5, Ocular 65X). Section taken from the periphery of the tumor. Note the essentially tubular arrangement of the tubules lying cut tangentially. A light upper area is an isolated tubule cut at right angles. Note the fine capillary net work separating tubules.

tion of etiology of the cell is very important. It has been possible to demonstrate cells identical with the tumor cells lying in apposition to compressed parenchymal liver cells as is shown in Fig. 8. These cells have no resemblance to the bile duct epithelium but resemble more nearly the atypical fetal parenchymal liver cells. Upon careful search with high power it is possible to find (as in Milne's case) a column of true liver cells which is continuous with the neoplastic cells (Fig. 8). This should make positive the origin of the tissue. The fact also, that the tumor cells are of epithelial character having a gland-like arrangement and that they have broken through the capsule and are invading the liver tissue proper justifies the diagnosis of adenocarcinoma.

The case presented falls in the class of the congenital primary parenchymatous adenocarcinoma of the liver. Tumors of this same character have been reported in even younger subject than the case presented making it certain that the neoplasm was prenatal in origin. The author has noted teratoid tumors in the newborn that resemble this case in many characteristics and one case (Yama-guchi) is described as a teratoid adenocarcinoma of the liver in a one-year-old girl. Again, Idzumi reports primary leucocarcinoma of the liver in a child aged seven months, which in addition to mucous tissue etc. contained distinct areas of osteoid tissue. He concludes that the tumor was of congenital origin.



Fig. 7. Photomicrograph (Spencer /3, Ocular 8X) similar to Fig. 6 and showing blood detritus in one oval space. Note irregular alveolar arrangement of cells. Also note the fine interlacing capillary system lined by endothelial cells, showing occasional dilatations filled with blood cells.



Fig. 8. Photomicrograph (Spencer /3, Ocular 8X) showing capsule of Glisson, compressed liver tissue and the blending into the hyperplastic cells identical in appearance to the tumor cells.

and that it contained misplaced embryonal rests.

The differentiation of adenoma and adenocarcinoma has been considered by various authors. For instance Milne classes his case as a simple liver-celled adenoma. His case is in every way similar to ours except that the tumor had not broken through the capsule and had not invaded the liver parenchyma. However his case is classed with the adenocarcinomata in the tabulated cases.

CONCLUSIONS

I. There are reported in the literature 42 cases of cancer of the liver in childhood (under 6) with the majority of diagnoses accurately made.

II. Our case is unique in the following respects:

1. A pedunculated primary parenchymatous adenocarcinoma of the liver in an infant

2. The first case reported where complete surgical excision was done.

3. Good surgical convalescence with death 16 days after operation from symptoms of acute enteritis. No post-mortem examination.

I wish to acknowledge my thanks to Dr. Frederick M. Lowe for the medical aspects of the case and to Dr. Jabez N. Jackson for the surgical data and the suggestion for making this report.

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MOBILIZATION OF THE DUODENUM

B. ALLEN B. KANAHEL, M. D. CHICAGO

THE case with which the third or inferior horizontal portion of the duodenum can be exposed and mobilized is not, I believe generally appreciated. An experience with two cases of extra peritoneal rupture of the duodenum emphasized the necessity for free mobilization and in the second I fell upon the method here described. It has served me well also in

those cases in which it is necessary to examine the head of the pancreas or the entrance of the common bile-duct into the intestine.

As is well known Kocher (1) suggested a method of mobilizing the duodenum in which the peritoneum covering the right kidney is incised vertically an inch outside of the second portion of the duodenum this is then detached inwards with the head of the pancreas.



Fig. 1. Diagram showing the retrocolic anastomosis the omentum being thrown upward. Note the bulging of the retroperitoneal tissues over the apex of the duodenum. The dotted line illustrates the length and direction of the incision which is to be made in the base of the blood supply.



Fig. 2. Shows mesocolon dilated. With the fingers and retracted into the fingers and retracted. Not that the head of the pancreas is in plain view.

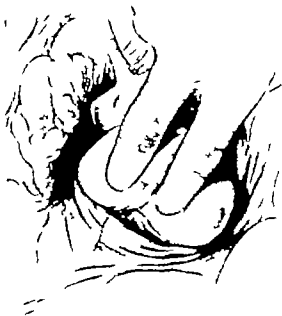


Fig. 3. Shows duodenum drawn up and everted. The arrow denotes the site of the entrance of the common duct into the duodenum.

Hertle (2) recognized the futility of this procedure in treating ruptures of the third portion but condemned Dambin (3) suggestion to go between the root of the mesentery and the mesocolon and suggested that we should lengthen his incision along the outside of the hepatic flexure of the colon and turn it up with the duodenum—a procedure that is surely possible but rather extensive. In my second case of duodenal rupture owing to the presence of fat necrosis in the retroperitoneal tissue I suspected an injury of the pancreas or probably a rupture of the duodenum in the experimental work of Richter (4) had demonstrated that a simple perforation of the duodenum could give rise to such a change. The region of the pancreas bowed so in ulceration I therefore turned the transverse colon and mesentery upward and elevated the back by means of a kidney levator. This brought out the third portion of the duodenum to the hepatic flexure of the colon and then to the mesentery. An incision of the peritoneum between the reflected colon and duodenum freely exposed

the third portion of the duodenum. By tearing the peritoneum the entire retroperitoneal duodenum was freed and brought into the field from the entrance of the bile ducts to the jejunal angle without hemorrhage or injury to any structure. That means an ureter a considerable tear in the gut I can bear personal witness.

On looking up the literature I find that Dambin in a *Lavis Thesis* upon rupture of the intestine suggested on anatomical grounds the possibility of going between the root of the mesentery and the mesocolon and Winiwarter (5) fell upon almost the same procedure as myself in treating a ruptured duodenum during the last year. I did not have the benefit of it however as it was not published until after my own experience.

The exposure can be made quickly and absolutely without hemorrhage or the injury of any vital structure. I have found it of especial value in those cases in which we must decide whether a patient suffering from a chronic pancreatitis, a carcinoma of the head of the pancreas or a tumor in the di-

verticulum of Vater. Here instead of the laborious and ineffect method of palpation from above we can in less than a minute turn up the colon nick the peritoneum and separate the edges with the index finger and raise the duodenum with the attached head of the pancreas from its bed. The entire head of the pancreas can now be held in the hand and in case of doubt a section removed for microscopic examination. The duodenum can now be rolled up and the site of the entrance of the common gall-duct examined from behind. The mobilization and exposure is so free that in thin individuals, at least it would seem that a stone could be removed if it were thought advisable although I have not had an opportunity to test it. In the obese owing to the excessive retroperitoneal fat, the procedure is somewhat more difficult, although I have used it for examination with satisfaction. Also a word of warning should be given against violent traction or handling, since it is well known that any extensive manipulation of the duodenum and pancreas is conducive to shock possibly because of their close association with the sympathetic

plexus. It has seemed to me that the cases where I have exposed the duodenum in the manner described have suffered more shock than is usual after a laparotomy but we must remember that these patients with long continued jaundice are poor surgical risks at best and any procedure upon them should be conservative and limited to the least possible trauma.

After the examination is complete a single fine catgut suture closes the rent in the peritoneum.

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THE PITUITARY GLAND IN ITS RELATION TO EPILEPSY

B. GEORGE C. JOHNSTON, M. D. PITTSBURGH

INVESTIGATIONS of the pituitary gland have been made post-mortem in epilepsy by a number of men, but the conclusions have been unsatisfactory and but few changes were found in the gland. It is quite probable that these investigators have been so concerned in the microscopic study of the gland structure that they may have overlooked other things of importance.

Nature considers the pituitary of such importance in the animal economy that she has located it in a most inaccessible and strongly fortified position lying in a deep depression in the roof of the sphenoidal sinus, in a bony pit roofed over with a strong prolongation of the dura and protected from pressure by the anterior and posterior clinoidal processes. The situation of this gland is unique and

arguing from analogy its importance is equal to the care that has been exercised for its protection.

Interest in the brilliant work of Dr Harvey Cushing formerly of Johns Hopkins and now of Harvard and an observance of the few cases of pituitary diseases in which epilepsy was an important part of the symptom-complex, stimulated us to an examination of the pituitary region in every case of epilepsy obtainable especially those in which no symptoms of pressure in the region of the pituitary (as evidenced by changes in the eye ground and visual fields) were present.

We were very soon compelled to divide the cases into primary cerebropaths, pituitary tumors and epileptics. In the majority of cases, little if any information was obtained

by roentgenography of the first class, but there remained a second class of patients who with an uneventful history no injury the ordinary children's diseases previous good health somewhere between the ages of 15 to 35 began to have attacks of petit mal gradually increasing in severity and frequency.

As our investigations began to include this type of cases, we noticed decided departures from our conception of the normal in the topography of the sella turcica (see plates). These changes were rarely found in the types of chronic epileptics but were found with a regularity that gave rise to intense interest in the second class of cases above described, namely those who with previous good histories, between the ages of 15 and 35 began to develop epilepsy. The changes consisted for the most part in an overgrowth of the anterior and posterior clinoidal processes, which, in addition to an increase in area and length, are slowly folded over and down upon the pituitary gland enclosing it within a bony basket. In addition to this process which evidently is one requiring a considerable length of time for its accomplishment there is very often noticeable a decided difference in the size of the pituitary fossa and therefore of the gland itself. The fossa is thus largely or completely roofed over in some cases, illustrations of which will be shown, in which the shadow of the anterior and posterior clinoidal processes not only meet but overlap. The frequency with which this condition has been found in this class of cases is quite striking. At first we were inclined to look upon it as a mere interesting anatomical deviation but when it reached a point where we were almost able to prophesy from the history of the patient and a physical examination the practical degree of roofing to be expected in a given case we were forced to attach some importance to this abnormality. Cushing and others had long previously shown that hypopituitarism was accompanied by epilepsy or epileptiform seizures.

In addition to this overgrowth of the clinoidal processes a large proportion of these cases have distinct increase in density in the laminae forming the roof of the orbit

the sphenoidal sinus, and the ethmoidal cells. In quite a number of cases, the sphenoidal cells are decidedly blocked with newly formed bony tissue. This condition resembles to a marked degree the appearance of the skull in general acromegaly and has been interpreted by us in accordance with a theory advanced by Doctors McKennan and Henninger as a localized acromegaly. Other investigations along this line will be published later.

Our investigations to date total some one hundred cases of epilepsy in which a very high percentage show one or more of these features.

The pituitary with its stalk the infundibulum lies within the sella covered over by a prolongation of the dura, the diaphragma sellae through an opening in which the infundibulum connects the gland to the brain. The anterior lobe is large and embraces on its median aspect the smaller posterior or cerebral lobe. The anterior lobe is of a glandular character histologically and is surrounded by a thick loose fibrous capsule. The posterior lobe is smaller and softer and to it directly comes the infundibulum. This portion of the gland histologically is rather nervous than glandular tissue especially during infancy and youth but it is not with the pituitary as an adjunct to the nervous system that we are concerned but rather with the possibility of interference with the posterior lobe of this gland in its functional relation. The anterior lobe resembles rather the thyroid and is rather kidney-shaped receiving its blood vessels and the infundibular stalk in the hilus much as does the kidney. It is said to increase in size until about the thirtieth year. Its blood supply is rich and its function in connection with the growth of the body is now thanks to the researches of Cushing and others so well understood that we need not discuss it at this time. In some animals the pituitary stalk persists during life and is continuous with the epithelium lining the mouth passing through a canal in the base of the skull and a condition resembling this occasionally met with in man where a canal in the phenoid lead from the sella turcica to the base of the skull



and contains a prolongation of the hypophysis. I have one such plate.

It is thus seen that the pituitary, owing to its peculiar location, may be encroached upon to a considerable degree by any hyperostosis of the posterior or middle clinoid processes, since the tough dural roof completes its enclosure by bone and it is our belief that the deviation here to be shown whether they are to be considered as anatomical deviations or as the result of a more or less

rapid bone deposit due to an inflammation (of the etiology of which we are yet ignorant) may cause a hypophyseal condition of which the epileptiform attacks are merely the symptoms. Cushing has shown that interference with the posterior lobe will cause a hyperexcitability of the cerebral cortex and we believe that the cases shown belong in this class wholly or in part.

I quote from Cushing on the pituitary as follows:



"One may reassemble the data in regard to the possible relation of hypophyseal insufficiency to epilepsy as follows

"1. Horsley it will be recalled in his first experimental hypophysectomies in the canine, observed no post-operative changes whatsoever in the condition of the animals. They were however used subsequently as subjects of cortical stimulation, and he noted that the motor cortex was unusually excitable.

2. As already stated, we have observed a tendency to epileptiform convulsions in a number of our animals kept for long periods after partial hypophysectomy — animals that ultimately exhibited symptoms which we attribute to glandular insufficiency

3. The study of a series of cases of hypophyseal disease in man has shown that epilepsy — a symptom unobserved in states of hyperpituitarism — is a frequent accompaniment of clinical conditions in which an insufficiency of the gland is manifest. Moreover that the brain under these circumstances, is possibly overexcitable, is suggested by the number of individuals in whom gustatory attacks have occurred under the influence presumably of a direct local irritation of the adjacent uncinate cortex by the enlarged gland.

4. As is well known, epilepsy is a frequent sequel of cranial injuries. In certain types of injury as the common bursting fractures of the base, the pituitary body is prone to be damaged.

5. If as we believe to be the case, the posterior lobe secretion normally enters the cerebrospinal fluid and thus comes to be in solution in a fluid which subsequently bathes the cortex it is possible that its diminution from hypophyseal disease or injury may unfavorably affect the activity of the cortical cells. On this basis it is conceivable that a local scar which involves or a tumor which presses upon, a given area of the cortex, may prevent the access to the cells of a substance which is essential to their functional stability

6. Many individuals, supposed to be suffering from so-called genuine or essential epilepsy present manifestations of a nutritional disorder — a tendency to adiposity and

a high sugar tolerance, coupled with a lowered temperature and pulse rate — closely akin to the constitutional state which characterizes hypophyseal deficiency. In some of these individuals the administration of hypophyseal extract has served to moderate the seizures from which they previously suffered."

The pituitary in common with other ductless glands, in order to functionate requires a blood supply. We are justified also in believing that it has periods of activity followed by repose (functionally speaking). During the periods of activity it is engorged with blood and an increase in its size and tension occurs.

A pituitary that is not roofed in has a decided advantage over one that is completely encircled and enveloped in a bony cell. Moreover in some of our cases it is hard to determine why the gland has not been completely cut off by a slow encroachment of the process above the gland and in one case, where there seems to be a calcareous degeneration of the gland going on we suspect that this has happened

We believe we are justified in asserting that the gland is handicapped by being encroached upon its circulation is hampered and its physiological activity mechanically interfered with and diminished, and that the epileptoid seizures are wholly or in part the result of the deprivation of the animal economy of those substances necessary to metabolism and produced within the pituitary. If this hypothesis is founded on any truth or fact then a patient suffering such epileptoid seizures (due wholly or in part to such deprivation) should be partially or completely relieved and made free from the seizures if it were possible to supply artificially that which is lacking and that of which the patient is deprived due to the partial or complete failure of normal supply from the pituitary. Two of my colleagues have found that the administration of the pituitary extract by the mouth is of distinct value in the specific class of patients under discussion not to the extent that it permits of the immediate substitution of pituitary extract in lieu of the well-tried bromides, but rather that the exhibition of pituitary extract in gradually in

creasing doses with bromide, followed by a slow withdrawal of bromide and the persistence of pituitary administration is followed by very interesting results. At first it was thought that the proper thing to do was to cease the bromides and substitute therefor the pituitary extract. Here, however we were soon taught that the administration of bromide is followed by immediate effect, whereas the administration of pituitary extract requires a considerable length of time before its beneficial effects are manifested. There elapsed, therefore, an interval during which the patient had no bromide and had not yet begun to experience the beneficial effects of the extract, during which time if such time were allowed to elapse, severe epileptic seizures were very likely to occur. From this it seems that the combined method of administration is the one to employ followed by the slow withdrawal of the bromide to a minimum.

Such a report as this can be considered merely as a preliminary one. The proof of such an hypothesis will require a very much larger number of cases than have yet been examined. The examination of any such case, to be of value must show distinctly and clearly the sella turcica and the processes. If the processes do not show that in itself is evidence that the case is probably one of hypopituitarism due to hypophyseal atrophy, with enlargement of the gland and pressure atrophy of the processes. Neither by any means, are all cases of epilepsy developing between the ages of 15 and 35 or 40 due to encroachment upon the pituitary. In some of these cases there will be found instead a very small pituitary but not encroached upon.

Cushing has devised an ingenious method

whereby the pituitary region can be reached and removed by a sellar decompression. Such an operation however is employed for the relief of intercranial pressure. What we now wish him to devise is an operation for the removal of one or both clinoidal processes in these cases of choked pituitary. If such an operation can be devised and performed before the process has been too long active and before the gland has suffered long from its imprisonment, it may be that such procedure will be followed by brilliant results. Such an operation, however will tax the skill and ingenuity of any surgeon.

We make no claims for the truth of the hypothesis comprised in this preliminary report since to establish such a claim will require that much more work be done than has been done. We present it with the hope that it may stimulate the interest of the men of this society, who alone, in this country are capable of carrying on such an investigation. These cases are widely scattered and no one man can hope, in a reasonable length of time, to see enough of them to make his single opinion of great value. If however the members of this society will carefully ray the pituitary fovea of every epileptic other than those so-called chronic practically congenital epileptics, keeping a record of the history of the onset of the attacks and the age of the patient, etc., within another year we should have a large number of such cases to report, and the truth of the matter could be easily established. Personally the thing works out with monotonous regularity due to the fact that Drs. McKennan and Henninger and also Dr. Mayer are trained and experienced neurologists, who select the epileptics who are examined.

THE PRODUCT OF A HOSPITAL¹

By E. A. CODMAN M. D. BOSTON

THE object of this address is to stimulate thought on and discussion of the standardization of hospitals. I take it that the word standardization implies a general movement toward improving the quality of the products for which hospital funds are expended. As a rule standards are raised by stimulating the best—not by whipping up the laggards. It is for this reason that I am selecting some of the best Philadelphia hospitals as hopeful material. Their weaknesses are less than those of other cities, so that what may appear to be local criticisms will be found to apply to all the great general hospitals in the cities of the United States.

In various manufacturing businesses I imagine that it is not difficult to render an exact account of the product of a factory. So many dozen tin cans, cakes of soap, tooth-picks, or pickled pigs' feet are readily figured up. With educational institutions and hospitals the problem is very different. The statement of the number of patients treated or of students graduated gives but a fraction of the products of such institutions. What, then, are the products of a large hospital, whether in the forms of healed wounds, healthy babies, faithful nurses, promising young surgeons and physicians, or in the more abstract forms of original ideas on pathology or treatment, model methods of administration, or such intangible things as enthusiasm and ideals?

It would be supposed that in the annual reports of hospitals some account of their products would be found. To a certain extent this is true, but often much of the material in an annual report is but a mere account of money subscribed and the proportionate amounts which are spent on the different departments.

I recently collected the annual reports of many of the large hospitals in America and endeavored to compare them with a view, if possible, to obtaining some definite form of report which would be available for all

such institutions and which would enable those interested to compare the work done by the different ones. Unfortunately many of the things which seemed to me of the first importance are scarcely mentioned if at all. I am proud to say that the report of the institution with which I am connected (the Massachusetts General Hospital of Boston) I find to be as full and instructive as the report of any hospital in the country, but even that carefully prepared volume is not wholly satisfactory.

For the sake of promoting discussion, I will briefly attempt to give an account of the products of this hospital for the year 1912, taking part of this information from the annual report, and mentioning some of the more important things which the hospital has accomplished but which are not stated in the report. I hope that in the discussion which is to follow we may learn some method of proportioning these different products in terms of relative value.

The Massachusetts Hospital has 320 beds and a large out-patient department or dispensary. Six thousand eight hundred and ninety-six patients were treated in the wards and 22,639 in the out-patient department. Similar gross facts can be obtained from almost every hospital report, but when an attempt at comparison of the figures alone is made, some ratio must be established between the number of beds in the institution, the number of patients, and the per capita expense. With these figures we may form a sort of bed unit, corresponding to foot-pounds in physics, which would show the product of the institution in the number of beds, the patients treated per bed, and the price per patient per day. The number of patients treated and the per capita expense are some indisputable facts which appeal to minds trained for business problems, as those of conventional hospital trustees. They feel that, having made their arrangements so that a single bed may be used by twenty-odd different patients at a reasonable

expense in the course of a year the question of cure or benefit is entirely in the hands of their medical brethren, and of little consequence to them or to those who support the hospital. Really the whole hospital problem rests on this one question: What happens to the cases? In this connection I want to speak of the work of Mr Michael H Davis, the business manager of the Boston Dispensary who has recently called public attention to a new viewpoint in hospital and dispensary management. He has applied the modern principles of business efficiency to institutional work by analyzing certain groups of cases coming to the Boston Dispensary. He is able to eliminate a certain proportion of visits as useless. From the point of view of treatment, there are certain diseases, for instance, gonorrhoea, which obviously cannot be essentially improved by one visit. These visits appear in the annual report, but cannot really be considered as products of the institution: they correspond to the badly made articles in a factory which have to be thrown away. Such a principle applied to the product of a hospital bed might show that twenty-odd cases treated by one bed in one institution might correspond to a far smaller number in another institution. To answer this question, one must turn to the portion of the report on the classification of diseases and the results obtained by each.

Leaving aside the number of patients treated and the question of whether or not these patients were benefited, there are certain products of the institution which are of great value, seemingly irrespective of the result to the patient. The most obvious is the instruction of medical students receiving clinical experience as assistants or as graduates or undergraduates. At the Massachusetts General Hospital 6,000 student-hours of instruction were given to 163 students in the lecture rooms or wards of the hospital, besides many hours of instruction at the Harvard Medical School in which data obtained from the hospital in the form of photographs and clinical experience of the professors were utilized. This estimate does not include our graduate or summer-school teaching. At first sight this instruction

seems proportionate to the number of patients but practically this is far from being the case.

In hospitals where the proportion of visiting surgeons and physicians to the number of patients is smaller, far less instruction can be given. Clinical treatment, as well as clinical instruction, requires time. The product of the hospital in the education of the medical student is by no means proportionate to the number of patients. There are much larger hospitals at which no such enormous amount of time is utilized for medical instruction. Besides the number of students and student hours, the quality of the instruction must also be considered. Personally I believe that the system of paying the instructors of a medical school by giving them an opportunity to do advertising as consultants is a vicious and false system. It puts too great a strain on weak human nature.

One might say that the instruction of the students is irrespective of the results to the patients, but let us suppose, in surgery, for example, that all the operations which have been watched by these students have been misdirected efforts at the cure of disease, and the students have learned to do something which is not worth while and does not really improve the patient. The product of the hospital in this case, even as regards student instruction, would be nil — even worse than nil. We are therefore, referred again to the classification of disease and the results to the patients, because a student would naturally wish to receive his instruction at a hospital where the treatment was shown to be of benefit to the patient. We may, then, say that the product of the hospital in medical education, like the product in the number of cases treated, depends on whether or not the cases are well treated.

Another product is the number of nurses graduating, and this product varies too, not only in number but in quality. At the Massachusetts General Hospital 34 nurses were graduated. I can easily show you that this list means much more than the number 34 by the following table which shows 60 positions filled by the superintendent of nurses at the Massachusetts General Hospital from her recent graduates.

- 10 superintendents of hospitals.
- 7 assistant superintendents of hospitals.
- 3 superintendents of training schools.
- 3 assistant superintendents of training schools.
- 5 night superintendents.
- 11 head of departments.
- 4 instructors.
- 5 medical social workers.
- 5 private school nurses.
- 5 medical school missionaries.
- 1 anesthetist.
- 2 district workers.

Thirty four nurses graduating to fill such positions as these means a product of a very fine quality but after all is it not important that the nurses should gain their experience in carrying out good treatment and are not nurses wanted at other institutions because they come from a clinic where the technique and the results of treatment are superior? Again we are referred to the classification of diseases in the table of results.

The Massachusetts Hospital also furnished the community with a product of 18 trained house surgeons and physicians. These men have gone into our community and others to practice the forms of treatment which they have learned at the Massachusetts General Hospital. Will they do good in the new positions which they occupy if the basis of their education was founded on opinion which ignored the real results of the treatment of their cases?

In 1912 53 ladies were either paid or voluntary helpers in the social service department. The social service worker is really a therapeutic agent—he forces the prescriptions of the physicians down the throat of the careless or refractory patient. She blindly believes that the prescription will do good. Does it? I must confess that I have doubt as to whether the actual treatment carried out by these social workers during the past year has given real benefit and yet I consider Dr. Cabot's exploitation of the social service idea one of the most important products of our institution in the last decade. But its real usefulness will only come when by scientifically tracing our cases we have shown that our prescriptions are really efficacious. As Dr. Cabot himself says: "In hospital without an expert and conscientious medical staff it is al-

most useless to establish social service. Every item of our social works gets its value from the accurate physical diagnosis with which we start or to which we try to contribute and from the rational plan of the treatment in which we are a led to assist. If the medical diagnosis is faulty the social work based on it may do serious harm.

To my mind, ridden as it is by the end result hobby, the social service department should be of greatest value as an instrument of recording the results of treatment.

From the more or less direct hospital products which we have been considering we now come to the less tangible ones.

In 1912 115 papers were printed by the staff of the Massachusetts General Hospital. All these papers are more or less products of the hospital—most of them entirely so. In considering this portion of the subject we must include the widening effects of past contributions and the accumulating thunder which next year will appear in print. Dividends of honor are still coming to the hospital from Bigelow's work on the hip-joint and Fitz's work on appendicitis, and we may hope that other epoch making papers are now in process of construction.

The publication of medical and surgical papers by members of our profession is a very interesting phenomenon. We are like boys throwing pebbles into a pond. Some stones fall without even a splash, producing only that peculiar sucking sound which we used to call "cutting an egg." Others splash, wake up the pond for an instant and send out more or less widening circles which fade away entirely or leave little ripples which nobody recognizes as belonging to the original splash. Occasionally some apparently dull boy when our backs are turned or when we are busy watching our own circles throws in a huge rock which starts an enormous wave and we all throw in a stone in a hurry and try to think that we made the wave our selves. As much of truth as there is in our own efforts coincides with and reinforces the wave until even its author is appalled by its size.

Think of the modest Würzburg professor and the tidal wave which has come from his

recognition of the previously unknown X-ray! Think of what that discovery has meant to almost every branch of science and especially to medicine and surgery! There is to-day hardly a disease in which the X-ray is not of benefit either for diagnosis or therapy. Think of the number of radiologists who hurried in to take some credit! Surely the product of that Würzburg laboratory is difficult to measure!

Such epoch making contributions, however, are not the ordinary products of our hospital factories. The ordinary paper is merely an additional stone thrown to swell the progress of the wave. And in fact some stones only do good by counteracting some other smart boy's big splash. Perhaps this negative product, after all, is one of the important functions of a hospital. But when we once realize the thousands of patients the world over who have benefited by the work of Fitz, and the millions more who have been helped by the lesser contributions toward the knowledge of almost every disease, which have come from the less famous workers at the Massachusetts General, we must confess that the good done to the 6000 patients whom we annually treat is nothing in comparison.

There remain many other by products of a hospital, some of which are important. To my mind the influence of the hospital on the standards of medical practice in the community is of greatest importance.

Great institutions are checks on the frailties of human nature. To a great institution like the Massachusetts Hospital men may give their effort toward the truth their aspirations for what is best, but they cannot contaminate it except briefly with their personal frailties. The great surgeon or physician may be avaricious, mean, ill-natured at home, jealous, even immoral or drunken, but when he appears for public duty at the hospital he must at least assume the appearance of virtue and efficiency. With his reputation behind him he may gull the public at his office or in his private hospital, but in the public institution the trained watchful eyes of his assistants, consultants, and nurses are ever on him. Youth's earnestness, hopefulness, and outspoken admiration mean much to him.

To hold his position he must travel and read, at least somewhat, to keep up appearances, and the habit of self-examination thus formed reacts on his private practice. The laity realize our temptations to bluff but they do not realize how much they are indebted to hospitals for discouraging this tendency to bluff and substituting a habit of bluffing so carefully as not to be caught. Just as in politics the self-seeker must exploit some popular demand to attain a coveted position, so in a modern hospital the physician or surgeon must gain some of his prestige by his advancement of medical science. As Professor James said in his *Essay on Habit*, even agnostics may in time become religious if they form the habit of going to church every Sunday.

I therefore place the raising of the standard of professional honor—or shall I say accuracy—in a community as one of the most important by products of a great hospital. And yet this very point brings up a most important question which can be expressed thus: Does a community get the best service by allowing as many as possible of its busy practitioners to brush themselves up by superficial work at the hospital, or by putting the hospital in the hands of a few paid men who shall set an example for the practitioners to follow? To put this proposition in other words, should each great city have one or more institutions organized like a private business institution, or should the big city institutions be run as they are at present, with unpaid staffs on a seniority system?

The answer to this question brings us again to the fundamental point in the whole hospital problem.

We must formulate some method of hospital report showing as nearly as possible what are the results of the treatment obtained at different institutions. This report must be made out and published by each hospital in a uniform manner so that comparison will be possible. With such a report as a starting-point those interested can begin to ask questions as to management and efficiency.

AUTHOR'S NOTE

A set of statistics had been prepared comparing the mortality at a certain semi-

private hospital of 200 beds with that of four of the best general hospitals in America having a total of 1200 beds. These statistics were obtained from published reports. They clearly showed that the semi-private hospital not only did many more operations, but that the mortality was much lower especially in some of the more difficult branches of surgery. The question was then raised as to the reasons why a 200-bed surgical hospital so excelled the four great general hospitals having together six times the number of beds.

Besides the many obvious reasons, such as the fact that many beds must be used for medical cases, the deprived and debilitated character of municipal pauper populations, the obligation which rests on charitable hospitals to make no selection of cases, the dependence on subscribed funds, the fact that the visiting physicians and surgeons are unpaid, etc. there remain other questions more directly related to the organization of the surgical department. These questions were prepared to be graphically presented by the following questions and answers to be exhibited on successive lantern slides.

Is it because busy men whose living is made outside the hospital control the operative material?

Which surgeons operate on the most difficult cases—those best qualified, or does seniority chance or the calendar decide such questions.

Should not honor belong to seniority rather than opportunity to operate?

Should not a surgeon do his routine operating on a staff of young men do his special work and private practice later in life when his aptitude for mere manual improvement has faded and his experience count?

If we had been allowed to begin to operate earlier could we not be doing it better than do so?

What good does it if a surgeon who is kept himself by doing simple operation which his juniors do as well?

Is an error similar problem question the surgical staff of the Massachusetts General Hospital did this?

They reorganized it such a way that each member of the staff undertook to get special study of some difficult class of cases, and in return the hospital suggested each member to the cases of that group.

The result has been that the mortality in these groups of cases showed great improvement and

our community has at its service a few men qualified to do each of these difficult operations.

Does the semi-private institution have less Waste Products?

For example, each day the patient is delayed by (1) slight or grave wound sepsis (2) the surgeon being detained by private practice (3) preventable complications such as bronchitis, phlebitis, cystitis, sinusitis, etc.

Or for example, all the days the patient was in the hospital—

If his hernia soon recurred.

If some of his gall-stones were not removed.

If his operation was unnecessary or inappropriate.

If his appendix was removed instead of his renal calculus.

If he died without a good excuse.

To whose interest is it to minimize these Waste Products?

Should the superintendent, the trustees, or the junior or senior visiting surgeons attend to it?

At any rate it would not be a popular task.

The Massachusetts Hospital has answered these questions by establishing an end-result catalogue. By means of this catalogue and two hours a week a superintendent, trustee or a senior surgeon can keep himself accurately informed as to what is happening to 6000 cases a year.

For whose primary interest is it to make the hospital efficient? For

1. The patient who seeks relief.

The public who support the hospital and in return expect a high standard of knowledge on the part of their own private physician or surgeon.

3. The hospital itself which as an institution has individuality of its own.

Who represents or acts for these interests?

Strangely enough the answer is none. It is for the interest of no one. It is the duty of no one.

For I stage.

For whose interest is it to investigate what is the actual result to the patient operated on?

For whose interest is it to insist on the resignation of incompetent old Doctor So-and-so who is one of the best of those that ever lived?

Who will warn the largest annual contributor that his agreeable classmate Doctor So-and-so is totally unfit to remove his stomach?

Who let say that hospital is doing more harm than good in surgery and that it fund would be better expended in initiation for nervous diseases?

There is difference between interest and duty. You do your duty if the work comes to you but you don't go out of your way to get the work unless it is for your interest.

Let us make attention to the medical and surgical efficiency of the hospital the *duty* of some one.

But if we think too much about *mortality* shall we not fail to do desperate operations which we should do?

Who should attempt these desperate operations — the man anxious to make a reputation, or the man who has made one?

The operation of gastrectomy for cancer of the stomach is a good example.

A mortality even as high as 50 per cent is justifiable because unfavorable as well as favorable cases should be done. But what surgeon doing private practice has reputation enough to undertake such a mortality? To be successful with this operation a man should have great surgical skill, special training on animals, abundant opportunities to do the operation, and security of reputation, so that his private practice will not be ruined by the necessarily high mortality.

Which of us with cancer of the stomach would not be willing to take a 50 per cent chance in skilled hands?

The Hospital Section of the American Medical Association, the American Hospital Association, and the Clinical Congress of Surgeons have each appointed a Committee on the Standardization of Hospitals.

The Carnegie Foundation has agreed to conduct an investigation.

Are you ready?

SUGGESTIONS

That each prominent hospital in this city appoint an efficiency committee consisting of a trustee member of the staff, and a superintendent.

That these committees inquire into the efficiency of their own hospitals, with a view to answering the questions which are sure to come from the Carnegie Foundation.

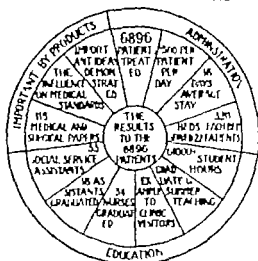
That an example of this kind set by the Philadelphia hospitals would lead to the establishment of similar committees in other cities, and eventually to a national organization representing the patient, the public and the individual institutions.

A graphic representation showing that all the radial facts depend on the central idea.

Beginning at the top and referring to the center we see that the *number* of patients treated is of no consequence unless they were benefited.

The cost per patient per day shows pure

PRODUCTS OF THE



MASSACHUSETTS GENERAL HOSPITAL 1912

extravagance if none of the patients were benefited but if all the patients were cured it would be a record for economy.

The average days per bed per year or average patients treated per bed per year are likewise affected by the ratio of success to failure.

Of what use are 61,000 student hours and all efforts to instruct nurses assistants, and graduate students and visitors, if we do not know what results we are obtaining? The value of the instruction is proportionate to our success in treatment.

If 115 papers are written on individual statements of the results of their writers observations or treatment, will they not carry more weight to the professional public if the authority of the hospital in its annual report endorses the writers statements by the presentation of the actual figures of patients cured or relieved?

In a similar way, all the important by products depend in the end on demonstration that the patient can be helped.

INCRUSTATIONS OF THE RENAL PELVIS AND URETER

By JOHN R. CAULK, A. M. M. D. SAINT LOUIS
Genito-Urinary Surgeon to Out Patients, Washington University

SINCE reporting to the American Association of Genito-Urinary Surgeons, last year a case of calcareous incrustation around one of the renal papillae I have encountered three cases exhibiting a somewhat similar pathological process which I desire to present for your consideration.

The whole question of stone formation and of calcareous deposition in the genito-urinary tract, as well as in the body tissues in general, is surrounded by such an atmosphere of confusion that much attention and interest have centered on it. Many hypotheses have been proposed and many debates created.

The pathological picture of the case above referred to seemed to warrant the conclusion that the incrustation of the renal papilla was secondary to a papillary necrosis. In reviewing the opinions of other men on the subject of calcareous deposits in the body tissues, it is found that the great majority are of the opinion that necrosis is the prime factor in such formations.

Delafield and Prudden in their chapter on "Calcareous Infiltration" say that in this condition there is a deposition either in the cells or intercellular substance of larger or smaller granules composed chiefly of phosphate or carbonate of calcium. Pathological calcification usually if not always, occurs in parts which are dead or in a condition of reduced vitality as a result of antecedent abnormal processes which as a rule, are of inflammatory nature. Fatty degeneration of the cells frequently precedes calcification.

Liek has found in his experiments that calcareous deposition in the kidney is markedly hastened by circulatory disturbances. Regarding circulatory disturbances Maschka says that heart disease can have an influence in the production of stone. Liek concludes that a combination of necrosis and circulatory embarrassment is necessary for calcareous deposits while Aschoff lays stress especially on urinary stasis and the excessive secretion of certain salts.

Ebstein calls particular attention to the rôle played by colloids. In stone formation he believes that colloids form the ground substance, which is absolutely essential, no matter what the composition of the stone. He was able to produce, in animals, renal, ureteral, and vesical calculi by feeding the animals on oxamide which he believes acts as a toxic agent on the epithelium of the urinary tract, causing degenerative changes and that the degenerated epithelial cells impregnated with oxamide form the nucleus of the stone.

Ehrlich considers the presence of iron in the tissues to have an important bearing on calcareous deposits.

Kumita believes that infection plays the important rôle in incrustations. This was contradicted by Tuffier.

Mueller says that, as a result of primary necrotic inflammation of the kidneys, salts are formed around the tissues which are injured and incrustations and stone formations ensue.

Litten proved that hæmorrhagic infarcts and tissues with arterial anemia possess a high affinity for calcium. Many authors believe in a specific diathesis. Some claim that patients suffering with gout, rickets, osteomalacia, and spinal caries have a special disposition to stone formation. This is greatly questioned by others.

Among the various diseases which have been proposed as having an etiological influence in stone formation have been typhoid fever, diphtheria, cholera, auto-intoxications, icterus, eclampsia, gout, and diabetes. The poisons which may predispose to this condition are cantharides, corrosive sublimate, chromates, chlorates, oxalic acid, aloin, glycenne, phosphorus, arsenic, and vinylamine. By chronic poisoning with the latter Levaditi was able to produce a papillary necrosis and secondary incrustation with salts. Thus it seems that the majority of observers agree that the essential process for calcareous infiltration is necrosis.

The question next arises: Why are these salts deposited in areas of necrosis?

The rationale of the deposition of salts in the damaged cells and tissues is not clear and much work is being centered on the problem. In infiltration in various tissues of the body the salts are derived from the blood and lymph, but in the genito-urinary tract they are evidently derived from the urine, which, it is highly probable, is hypersaturated with them on account of a special diathesis.

The presence of phosphorus in the affected tissues, the existence of fatty acids with which the calcium may form insoluble soaps, and proteids capable of uniting with calcium have all been advanced as determining factors. This whole question was admirably presented by Wells in his Harvey lectures.

The comparative rarity of primary incrustations in the upper urinary passages seems to me to make the report of the four cases not superfluous.

CASE. Obstructive calcareous papillitis—retention cyst of the kidney. This case was reported in detail in the *Transactions* of this association last year and in this report the history will be given in abstract.

Patient, male, 46 years of age, farmer. Complained of a dull aching pain in the right side beneath ribs, occasional reflection along the ureter into the scrotum, also had symptoms referable to the posterior urethra and prostate.

Family history. Father died of cancer.

Personal history. There is nothing of importance in his personal history with the exception of typhoid fever at the age of

Present illness. His present trouble started about year and a half ago with an acute colic in the right side below the costal margin which radiated along the ureter into the scrotum. Since this time there have been many similar attacks. Coincident with this there were increased frequency and slowness of urination, slight hesitancy and diminished force of the stream, and hematuria. The attacks of pain were described as exceedingly severe in the beginning, but were quieted by local applications. He did not pass stone or gravel. The pain in the last attacks were not sharp, but of an aching, throbbing character. Upon examination it was found that the urinary distress was due to subacute prostatitis and posterior urethral engorgement which promptly cleared up on treatment of these organs. The throbbing pain in the right side however persisted. An X-ray picture at this time showed small crescentic shadow in the region of the right renal pelvis. Ureter catheterization procured perfectly normal urine from both sides,

with the exception of an occasional red blood-cell from the right. Pthalein test appeared on the right side in nine minutes, on the left in eight minutes. First hour output on the right side, 15 per cent. second hour output, 2 per cent. First hour on the left side, 8 per cent. second hour 3 per cent. On the presence of the shadow and the finding of a few blood-cells from the centrifugized urine, a lumbar nephrotomy was done, and the following interesting pathological picture was obtained. A cyst the size of a small walnut was found in the lower pole of the kidney, corresponding to one of the pyramids, the papilla of which was incrustated with a calcareous material, which later was found to be composed principally of calcium phosphate. As this paper has its bearing only on incrustations, a description of the cyst and of the kidney in general will be omitted.

A pathological report of the papillary lesion given by Dr. Opie is as follows: The sections were preserved in 4 per cent formalin and the material was decalcified with 5 per cent nitric acid. Blocks were mounted in paraffin and stained with hematoxylin and eosin. The section of the papilla with the incrustation showed that the tip of the papilla was covered with a homogeneous material which took a deep blue stain of decalcified material. The tissue in immediate contact with this mass has undergone hyaline degeneration. In this hyaline area, as the calcified mass is approached, numerous minute calcified granules are seen. Deeper into the substance of the papilla the tissue is loose in texture and contains numerous small blood vessels. There are also occasional collections of lymphoid cells. It was thought that this condition was due to a primary necrosis of the papilla, with a secondary deposition of calcium phosphate.

CASE 2. Incrustation of calcium phosphate on the posterior wall of the renal pelvis. Patient 35 years of age, male. Complained of aching pain in the right kidney region and blood in his urine.

Family history. Negative.

Personal history. The only diseases of importance were diphtheria at the age of 8 and catarrhitis in 1900. Following this the patient began to suffer with pain in the right kidney region and occasionally with pain in the right side lower down for which he sought relief in the hands of Chicago surgeons. He removed his appendix, which was said to be gangrenous. Shortly after this he had another similar attack, and since then he has had attacks with much greater frequency. In October, 1909, during the course of one of these attacks, he passed blood in his urine. Since then he has passed blood with most

of the attacks of pain. I saw him in November about one week after one of his sieges.

Examination. Patient was a slender anemic individual, but nothing abnormal was found in his general physical examination.

Cystoscopic examination. Catheter passed easily. Residual urine. Bladder capacity normal both ureteral orifices normal in appearance. Ureteral catheters passed easily on both sides and the urine showed the following: Right side, many w. b. c. few r. b. c. and colon bacilli, albumin and casts left side clear no albumin, few b. c. Phenol sulphophthalein, given subcutaneously in a 6-oz. dose, appeared on the right side in 1 minute first hour output, right side, 3 per cent. Left side appeared in 1 minute first hour output 35 per cent. X-ray picture showed a shadow in the region of the right kidney pelvis.

Operation. Right lumbar nephrotomy, kidney freed and delivered and bisected with silver wire. No stone was found in the kidney. By invaginating the renal pelvis it was found that brownish incrustation lined the greater part of the posterior wall. A sponge was packed below and this calcareous material shelled off from the wall of the pelvis to which it was very adherent, and in one place the pelvic wall was torn during the removal of the material. The tissue under the calcareous material was very granular and friable. After the incrustation was completely removed the pelvis was irrigated thoroughly. Kidney closed in the usual manner. Small drain to kidney. Wound closed with interlocked catgut. Following operation there was slight urinary leakage for three days. This promptly ceased, and the patient made an uninterrupted recovery. Since then he has been perfectly free from pain, has gained weight, and the urine is perfectly clear.

Whether the necrotic pelvic wall was secondary to the calcareous deposit or whether the changes in the pelvic wall were primary and responsible for the deposit, cannot be definitely stated but from the pathological findings of the other observers it would seem that the calcareous deposition was secondary to the changes in the renal pelvis, similar to what was found in the papilla in Case 1.

CASE 3. Incrustation of the upper ureter. Patient, woman 3 years of age, bone complaint was intermittent attacks of sickly pain in epigastrium and an occasional soreness in right upper back.

Family history. Negative.

Personal history. No acute illness, no chronic cardiac pulmonary or gastro-intestinal disorders. Menstrual history normal. Has borne two children both deliveries normal. There was never any trouble during her pregnancies.

Present illness. Two months after first child was born (eight years ago) she was suddenly seized with cramps in epigastrium region which lasted for several hours. Pain did not radiate and as she described it "stayed in the pit of her stomach." Since that time she has scarcely passed a day without having a similar pain. These attacks have borne no relation to food or to constipation. Has never had any chills, fevers, sweats, or jaundice. There has been absolutely no urinary frequency pain or hematuria. Two years ago she had her appendix removed for the trouble but without relief. Since that time she has been observed by numerous men, who have presented various diagnoses. Among the diagnoses may be mentioned gall-stones, cholecystitis, gastric and duodenal ulcer, pyloric spasm, pelvic inflammatory disease and others. During this time she has had about thirty X-ray pictures and fluoroscopic examinations with blank results. Her husband who is a friend of mine, declared that I determine the condition of her kidneys. On inquiring into her case I found that she had absolutely no symptoms referable to her kidney regions with the exception of an occasional ache in right upper back. She had never passed any stone or "gravel" to her knowledge.

Examination. In spite of all the trouble and suffering she was very well preserved. There was nothing found in the general abdominal examination. No tenderness anywhere in the abdomen. Urine perfectly clear but on centrifugalization an occasional w. b. c. and some calcium oxalate crystals were found. A trace of albumin. Cystoscopic examination showed a perfectly normal bladder. The right ureteral orifice was slightly larger than the usual but presented no evidences of an inflammatory reaction. Left catheter passed easily to the renal pelvis, right catheter was obstructed three inches lower than the left. Urine from the left side negative. From the right occasional w. b. c. and many calcium oxalate crystals. As I thought it possible that her condition might be due to an intermittent hydro-nephrosis, both pelvises were injected with 10 per cent collargol. The left pelvis was normal. On the right side I was unable to get the collargol into the pelvis. Immediately after withdrawing the catheter patient was seized with pain similar to the ones above described which lasted about two hours and required morphia. Following this attack she voided urine which contained many particles similar to crushed eggshell but of a yellowish-brown color. Several days later an X-ray picture was taken and showed a faint shadow about one and one-half inches long evidently in the upper ureter. A shadowgraph catheter was passed and another picture taken. The catheter obstructed exactly at the lower margin of the shadow. At this time the catheter was manipulated freely following which she passed considerable amount of this granular material. Since this time she has never had an attack of pain, has gained a great deal in weight and feels perfectly well. After the third treatment

catheter passed easily to the pelvis, and an X-ray picture showed that a shadow was still present but considerably smaller. Encouraged by the relief obtained by the ureter catheter, I attempted to remove this deposit by means of the catheter. After ten manipulations, extending over a period of three months, in which the patient had been perfectly free from pain, an X-ray picture showed no shadow. After each catheterization I injected the upper ureter with 10 per cent argyrol. The functional test with phenolsulphonephthalein, given after the third manipulation, yielded the following: Time of appearance, eight minutes on both sides. Right side, first hour 9 per cent second hour 0 per cent. Left side first hour 10 per cent second hour 10 per cent.

A résumé of the important facts of this case is as follows: (1) Reflection of pain to the epigastrium with no radiation along ureter and no urinary distress. (2) marked amelioration after the second ureter catheterization. (3) numerous diagnoses of different abdominal conditions and (4) the removal of the incrustation by means of the ureter catheter.

In the beginning I was at a loss to know whether to advise operation with the removal of the calcareous deposit, or to attempt the procedure which was finally adopted. It impressed me that, having a normal kidney and a long incrustation in a narrow canal, with evidently an inflammatory ureter back of it, the chances of subsequent stricture would be great, with a probability that a nephrectomy would have to be the final issue. Hence it seemed that even if the incrustation could not be removed, if the patient could be relieved of pain and the ureter kept patent this would be the most desirable. I solicit the opinion of this association on this particular point.

CASE 4. Male 33 years of age, complained of an aching pain in right side beneath costal margin.

Family history. Negative.

Personal history. Gonorrhea as a young man, no complications. Typhoid fever in early adult life otherwise negative.

Present illness. Five years ago patient had an attack of colic in his right side, radiating into the scrotum and penis, associated with urinary frequency and pain, followed by the passage of small irregular calculi. Since that time he has had three similar attacks, each time passing small jagged stones. General health has been good since his last attack. Chills, fever, or sweats, and no urinary distress. Three days before I saw patient he began to complain of an aching pain in the right side

beneath the ribs, with a feeling as though his side were being blown out. There was marked diminution of urinary secretion and for 24 hours patient had been nauseated, vomited, and suffered with headache also slightly irrational. Temperature ranged from 100° to 101.5° F. During the previous 24 hours had voided but three ounces of urine.

Examination. A large man, flushed, slightly irrational, marked tenderness in right kidney region with kidney considerably enlarged.

Cystoscopic examination. Catheter passed easily two ounces of very concentrated urine withdrawn. Bladder capacity normal. The left ureteral orifice normal in appearance, right ureteral orifice edematous and pouring. Ureter catheter passed easily on the left side, but on the right side was obstructed one-half inch within the orifice. On manipulation small particles escaped by its side. With the catheter in place, sterile water was injected into the ureter for the purpose of washing out some of the contents. The urine from the left side was clear and contained no pus cells or bacteria but many hyaline casts. No urine could be collected from the right side. Patient was put on rectal salt solution, purged and given large quantities of water to drink. X-ray picture showed a very faint shadow about three-fourths of an inch long low down in the ureter corresponding to the location in which the catheter was obstructed. The following day a shadowgraph catheter was passed into the orifice, and after much manipulation passed by the obstruction. Large quantities of urine were drained through the catheter and patient was relieved of his pain. The urine was loaded with calcium oxalate crystals. After the kidney was thoroughly drained catheter was again moved to and fro in the lower ureter and argyrol injected. Two days later a similar procedure was undertaken. The material which passed was not only sandy but there were many long, flat spicules, similar to those in Case 3. This patient was advised to keep himself under close observation and to have the catheter passed at frequent intervals. However he failed to take the advice given and I have not seen him since last August, but he writes me that he is feeling perfectly well and has no trouble.

It is to be observed that the incrustations in the cases above referred to occurred in different parts of the upper urinary tract, establishing no special point of predilection. Two of the cases exhibited a definite pathological background for the calcareous deposit—an inflammatory lesion of the renal pelvis in one case and of the papilla in another. In the ureteral cases not coming to operation the fundamental lesion could not be determined but in the light of the other two cases, it is safe to assume that such a lesion was present in these also and served as

the etiological factor for the calcareous implantation. In the two cases in which the incrustations were examined chemically it was found that they were composed of calcium phosphate with traces of calcium oxalate. In the two ureteral cases, I was unfortunate in not securing enough of the material for chemical analysis. In Case 3 through a mistake, the nurse did not save the total urine as I had directed and in Case 4 I forgot to leave instructions for the urine to be retained and strained. However the urine in these two cases contained calcium oxalate crystals and the dry material presented a gross appearance similar to the other cases. Thus it seems evident that the deposit in all four cases consisted of calcium. As possible etiological contributors to the incrustation in the four cases typhoid fever in two cases, diphtheria in two cases, and tonsillitis in one case may be mentioned. In the last mentioned case immediately following the attack of tonsillitis, the first renal storm was ushered in. It seems highly probable that there had been an acute pyelitis.

Case 4 (incrustation of the juxtavesical ureter) had passed previous calculi which must undoubtedly have caused inflammatory changes and necrosis of the lower ureter. Case 3 (upper ureteral incrustation) presents a negative history as to the passage of calculi. It is possible however that in her initial attacks calculi may have passed which produced changes in the upper ureter and afforded a nidus for calcareous implantation. On the other hand it may be that there had been a local circulatory disturbance. Three of the cases were males and one was a female. The symptomatology of three of the cases suggested a kidney lesion and presented nothing of importance. Case 3 (upper ureteral incrustation) presents an interesting feature in that there were practically no symptoms referable to the kidney with the exception of a very occasional soreness in the right back. The reflection of the acute pain to the epigastric region, occurring in paroxysms of great frequency which suggested to many able clinicians and surgeons some intraperitoneal lesion, is noteworthy. It is possible that many of the pains simulat-

ing gastric and duodenal ulcers and gall-stone colics may have their origin in lesions in the upper ureter associated with an intermittent hydronephrosis.

Concerning the diagnosis of these incrustations, each of the cases within the pelvis was diagnosed as renal calculus and the true diagnosis was established only at operation. The two ureter cases were diagnosed as incrustations based on the following facts: (a) Faint X-ray shadow similar to Cases 1 and 2 (b) the passage of crushed eggshell like material following manipulation with the ureter catheter (c) the passage of the catheter through the obstruction relieving the patient of symptoms the X-ray shadow still persisting and finally the gradual disappearance of the shadow as in Case 3 by manipulation with the ureter catheter. These points seem to differentiate a true incrustation from a calculus or sandy impaction.

The treatment of such cases depends upon their location. Incrustations around the papillae or in the renal pelvis should be removed by nephrotomy provided they are productive of symptoms which demand operative intervention. The ureteropelvic junction should be blocked to prevent any particles from getting into the bladder. After the removal of the incrustation the pelvis should be thoroughly lavaged. Post-operative treatment is similar to that of an ordinary stone case, with the exception that the pelvis should be injected with argyrol several times during the first few months. Pyelotomy seems inadvisable in such cases, as it will not provide sufficient exposure to insure the complete removal of all of the calcareous material. With incrustations in the ureter our object is to do as little damage as is possible to the ureter in attempting their removal, so as to lessen the liability to post-operative stricture. In the removal of an ordinary calculus, the calculus can either be milked back into the dilated part of the ureter and thence removed through a small incision, or it can be moved in loco through a small incision, being extracted endwise whereas with incrustations these procedures cannot be adopted. It would be necessary either to open the ureter throughout the length of the deposit in order

DEPARTMENT OF TECHNIQUE

THE PATHOGENESIS AND TREATMENT OF HERNIÆ OF THE LINEA ALBA¹

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ALL herniæ that occur in the midline of the abdomen with the exception of those that occur at the umbilicus, are grouped collectively under the name herniæ of the linea alba. They are far more frequent above the umbilicus than below this is due to the greater width of the linea alba above the umbilicus. Longitudinal bulgings of the linea alba are occasionally called herniæ, but they are not herniæ in the true sense of the word, because there is no defect in the transversalis fascia. These bulgings are caused by a wide separation of the recti within their sheaths.

Because of their greater frequency above the umbilicus, these herniæ have also been called "epigastric herniæ." Epigastric herniæ vary greatly in size some may be no larger than a pea, others again may attain the size of a fist. The larger sizes are very likely to occur in the immediate vicinity of the umbilicus in fact it is still a question whether these are not really umbilical herniæ. The greater majority however are very small in fact many are so small that it is questionable whether they are herniæ in the true sense of the word. In most of the cases that I operated, I have failed to convince myself that, prior to the operation, there existed a true hernia, with a true sac.

Surgical anatomy. The linea alba, placed in the midline of the abdomen between the two recti muscles, is an aponeurotic structure formed by the union of the sheaths of the recti on either side. It is broader above the umbilicus than below and behind is in relation with the peritoneum, but separated from it by the transversalis fascia.

Fig. 1 shows, schematically not only the formation of the linea alba, but also its relationship to the transversalis fascia and peritoneum. As in other parts of the abdomen, the blood-vessels run between the peritoneum and the transversalis fascia. Normally the linea alba above the umbilicus is perforated by numerous

blood-vessels. These vessels must of necessity perforate the transversalis fascia; and in so doing, receive the customary outward prolongation of the transversalis fascia. At the level of one of these vessels, therefore, the linea alba should be represented schematically (Fig. 2).

The space between the posterior sheath of the rectus and the transversalis fascia is very narrow. Indeed, the space is purely a hypothetical one. Furthermore, if it is considered, as I have shown upon a previous occasion, that at the point where the vessel pierces the transversalis fascia there is an outward prolongation of this structure, even this hypothetical space disappears, because at this point the linea alba and the transversalis fascia are joined. I have explained at some length an apparently very trivial point but this point is of great importance, enabling us to explain certain peculiarities of an epigastric hernia.

This hole in the transversalis fascia, through which a vessel passes to the surface is a weak spot, and it requires merely an increase in the intra-abdominal pressure for the nearest subjacent structure to be forced into it.

I now wish to call attention to another anatomical point, whose importance has not been recognized namely that in the midline of the abdomen, or rather slightly to the right of the linea alba, there is attached the falciform ligament of the liver. This ligament is composed of two layers of peritoneum, enclosing considerable adipose tissue. Anteriorly this adipose tissue is in close juxtaposition with the transversalis fascia of the abdomen at the linea alba.

A diagrammatic horizontal cross-section of the linea alba at the point where it is pierced by a blood vessel can, therefore, be illustrated as in Fig. 3.

Given a hiatus in the transversalis fascia made by the piercing of blood-vessel, it is manifest that the first tissue that can be forced through this opening would be the preperitoneal fat enclosed in the falciform ligament.



Fig. 1. Diagrammatic cross-section of anterior abdominal wall, illustrating the formation of the linea alba.

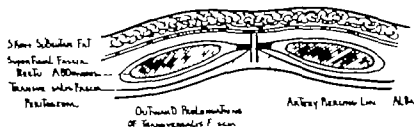


Fig. 2. Diagrammatic cross-section of anterior abdominal wall illustrating the linea alba, at point, where it is pierced by blood vessel. Note outward protrusion of the transversalis fascia.

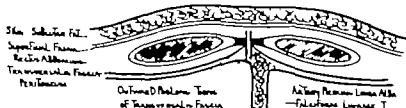


Fig. 3. Diagrammatic cross-section of anterior abdominal wall, illustrating the linea alba, at point, where it is pierced by blood vessel, and showing also the formation of the falciform ligament of the liver.

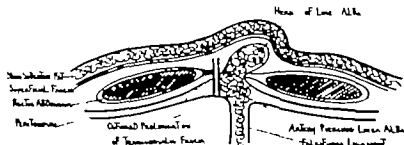


Fig. 4. Diagrammatic cross-section of hernia of the linea alba, illustrating its coverings.



Fig. 1. M. L. A child suffering from scoliosis with the convexity to the right. This patient has been rotated as far as possible to the left; i. e. away from the convexity of the curve. This treatment increases the deformity—the flattening of the ribs on the right side and the convexity of the curve to the right.



Fig. 2. M. L. The same child as in Fig. 1. The child has now been rotated as far as possible to the right; i. e. towards the convexity of the spinal curve. It is to be noticed that the deformity has been improved here. The spine appears straighter. The flattened ribs on the right side have been broadened.

at present available. Physiological scoliosis is produced by two means—by side-bending and by rotation. I believe that the latter is the best means, because rotation is the freest of all movements in the dorsal region; thus the greatest correction is available by it. I, therefore, advocate the rotation treatment for the physiological reduction of the deformity of scoliosis. The practical application of this form of treatment is best carried out by rotating the patient by means of the arms toward the side of the convexity of the organic (if dorsal) deformity. This may be done while the lower extremities are flexed on an already flexed spine. This attitude is best procured in the recumbent position.

Correction having been produced in this manner (2, 3, 4), it must be maintained by the use of a plaster of Paris or celluloid jacket.

If maintained for a sufficient length of time and under suitable conditions, the law of Wolff can be depended upon to assure that correction of a deformity for the correction of which we are without knowledge of forcible means.

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UTERINE ENDOSCOPY AN AID TO PRECISION IN THE DIAGNOSIS OF INTRA-UTERINE DISEASE¹

A PRELIMINARY REPORT WITH THE PRESENTATION OF A NEW UTEROSCOPE

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THE diagnostic methods usually employed to determine the nature of intra uterine disease frequently fail to afford the desired information.

A brief review of the methods in common use will serve to show how lacking in precision they are. First, bimanual or vagino-abdominal palpation applied under the most favorable circumstances, discloses only abnormalities in size, contour position and mobility of the uterus and the pelvic viscera. Even after such examination, the nature of any disease existing within the uterus can only be surmised from our knowledge of pelvic pathology and previous experience in such cases. Second the use of the uterine probe in exploring the cavity of the uterus adds very little to the information obtained through the bimanual procedure. By sounding the uterine cavity its depth and possibly any gross irregularity in its shape also the presence of large tumors extending into it, may be determined but disease of the endometrium, such as polypoid endometritis or malignant degeneration, would still evade detection. Third, digital exploration of the uterine cavity is a procedure which is attended by many difficulties. It is rarely resorted to, and even when used rarely affords satisfactory information. Few of us are provided

with an index finger so small that it may be easily introduced through a cervical canal even after full dilatation. Few if any of us have pursued this method of examination with sufficient skill to enable us to differentiate with certainty the serious from the benign lesions of the endometrium.

The last diagnostic method usually resorted to for the exclusion of the examination of the uterus after its complete removal, consists in curettage of the uterine mucous membrane and microscopic study of the scrapings. While yielding more precise information than any of the others even this method proves disappointing and frequently leaves us in a state of uncertainty.

The necessity for greater precision in the diagnosis of intra uterine disease especially in cases of suspected malignant neoplasms of the fundus of the uterus, was most forcibly impressed upon me by two cases recently observed. On a

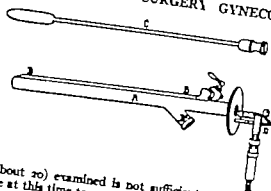
woman of 45, with suspected cancer of the body, was subjected to curettement. The pathologic report of the scrapings was negative for cancer. In three months the symptoms, chiefly hæmorrhage, returned, and believing that cancer must be present, the uterus was removed. The patient died in three days from general peritonitis. The uterine mucous membrane had undergone polypoid degeneration but showed no evidence of carcinoma.

The second patient was subjected to a vaginal hysterectomy on the supposition that she too had incipient cancer. Thorough examination of the uterus failed to reveal anything more than hyperplastic endometritis, which probably would have yielded to thorough curettage. The life of one patient and the uterus of the other were sacrificed to uncertainty in diagnosis.

In the attempt to reduce and if possible eliminate the perplexity in which similar cases have left us I have devised an instrument—the uteroscope or uterine endoscope—which enables us to explore the cavity of the uterus and carefully inspect the entire endometrium. It is not recommended as a panacea for all of our diagnostic ailments, but as an aid in determining the cause of some uterine diseases of obscure origin. Its use in just the type of case detailed above should be of incalculable benefit to both patient and surgeon. Through its employment it should be possible to distinguish, with a greater degree of certainty such pathologic conditions as glandular hyperplasia, uterine polyps, retained products of conception, submucous fibroids, and malignant tumors of the endometrium. The microscopic changes occurring in the mucosa during menstruation might also be observed in favorable cases.

The uteroscope herewith presented consists of the following parts: endoscopic tube (A) irrigating attachment (B₁ inlet B₂ outlet) obturator (C) lighting attachment (D) as in Young's urethroscope.

In order that I might perfect the technique of its employment and become familiar with the appearance of the endometrium in its different variations from the normal I have used it in every case subjected to dilation and curettement during the last six weeks. The number of uteri



(about 20) examined is not sufficient to permit me at this time to present a great amount of important data concerning the endometrium, either in its normal or pathologic states. The following observations, however, have been made.

The mucous lining of the body of the uterus is dark red in color and of a velvety appearance. It bleeds easily when subjected to even slight trauma. After complete dilation (to 46 French) the internal os contracts again quickly and on gradually withdrawing the uteroscope can be distinctly observed as a narrow gateway between the cavities of the corpus uteri and the cervix.

The color of the mucous membrane of the cervix varies from yellowish to pinkish, according to the degree of congestion in the small blood-vessels, which latter can sometimes be distinguished. The arbor vitae arrangement of the mucous membrane in cervix which are not badly lacerated is readily observed.

In one case of glandular hyperplasia — so-called villous endometritis — of the hemorrhagic type, producing symptoms simulating cancer, the entire mucous membrane of the body presented a distinctly shaggy appearance, and when removed was found to be greatly thickened.

In case of incomplete abortion a piece of foetal envelope, yellowish in color and about one-half inch long and one third inch in diameter was observed attached to the fundus near the uterine orifice of the left tube and as easily and completely removed with small placental forceps.

Technique. The examinations with the uteroscope thus far made have been under general anesthesia, but it is my purpose in suitable cases to resort to local anesthesia of the cervix and uterine body by the injection of novocaine alone or combined with adrenalin.

In the use of the uteroscope as in other intra-uterine manipulations, asepsis of the vagina is essential and should be obtained by approved methods. The uteroscope is sterilized as follows: the metal tube and obturator are boiled for at least five minutes; the lamp holder and lens are

immersed in 70 per cent alcohol for at least ten minutes; a sterile muslin bag is slipped over the electric cord and secured to the metal rod by a purse-string. All parts can then be handled without infecting the fingers of the operator.

Anesthesia having been obtained, a self-retaining univalve speculum is introduced into the vagina to retract the perineum; the anterior lip of the cervix is grasped with two double tenacula, and the cervical canal dilated with graduated bougies. The dilation should be done very carefully in order to limit the hemorrhage resulting from laceration of the tissues around the internal os. After thorough dilation (to 46 French) the uteroscope is introduced until the point of the obturator meets the resisting wall of the fundus, when the obturator is to be withdrawn. The desired degree of illumination having been previously obtained, the cord is attached to the lamp holder and this in turn to the endoscope.

It is well to flush the uterine cavity with saline solution at 11 F by means of the irrigating attachment and to swab it gently through the tube before making the observations.

The chief difficulties encountered in the use of the uteroscope are hemorrhage and acute flexions of the uterus. The latter is usually overcome by dilating the uterus with graduated bougies, if proper precautions are observed to prevent puncture of the uterine wall. Thorough dilation having been procured, the introduction of the uteroscope is attended with little or no difficulty.

Profuse and uncontrollable hemorrhage prevents satisfactory examination with the uteroscope. The difficulty produced by a small amount of bleeding may be surmounted by flushing the uterine cavity through the irrigating attachment, with saline solution at 115 F, and swabbing with cotton or gauze through the endoscopic tube by aid of long forceps. If this is not successful the uterine cavity should be tightly packed for a few minutes with gauze either plain or saturated with 4000 solution of adrenalin chloride.

Contra-indications. Uterocopy like other intra-uterine manipulations has within itself the possibility of injury if unwisely employed. It seems almost unnecessary to caution against its use when pregnancy is known to exist or is even suspected. It is contra-indicated in acute infections and inflammations of the genital tract and peritoneal structures. Its application during the existence of chronic pelvic inflammatory disease should be limited to those cases in which operative treatment of the diseased parts is to be immediately undertaken, for it must not be forgotten that

traumatism of the uterine tissues is likely to result in a relighting of a latent pelvic inflammation.

While not contra-indicated in those cases of pelvic disease in which the changes in the uterus itself are of less importance compared with concomitant disease of the other pelvic viscera, the information which it affords is of doubtful utility from the standpoint of either diagnosis or treatment.

CONCLUSIONS

1. There is a well-recognized need for methods of greater precision in the diagnosis of intra-uterine disease.

2. Greater accuracy in the diagnosis will diminish the resort to unnecessary and destructive operations.

3. Uteroscopy affords information concerning changes in the endometrium *in vivo* not obtainable by any other method of investigation.

4. Uteroscopy, like similar diagnostic procedures, has its limitations and definite contra-indications.

Its use should be restricted to those cases in which it can elicit valuable information without endangering the health or life of the patient.

LARYNGECTOMY COMBINED WITH GASTROSTOMY¹

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THE feeding of a patient who has been subjected to an extensive laryngectomy especially if complicated by a partial resection of the pharynx, is attended by difficulties and dangers. If a permanent tube is introduced through the nose into the oesophagus, its constant presence not only causes the patient much inconvenience but also interferes with the healing of the wound, through the fact that the tube which cannot be kept aseptic, resists against the suture of the pharynx. This suture becomes infected and gives way and not rarely necrosis results. The infection spreads downward, and the tracheal stump which had been sutured to the skin, may separate from it here and there. It may then happen that, even after the patient has successfully rallied from the operation, such he will aspirate secretions and succumb to a pneumonia.

If on the other hand the stomach tube is introduced every time the patient is to be fed, the conditions are, if anything, still worse, for the introduction of the tube which will be done at least occasionally by the nurse may easily result in perforation of the suture line. I have experienced such a case in which the tube had been pushed through the suture line of the pharynx, and the accident was not noticed until the fluid food that was poured into the tube ran through the dressings into the patient's lap.

In the case here presented I overcame these difficulties in a very simple way. When the laryngectomy had been completed, I performed a gastrostomy according to Witzel's method

in order to administer the food through the gastric fistula. The case was far advanced one in which not only the whole larynx and epiglottis had to be removed but the anterior wall of the pharynx also had to be resected to the extent of 3 or 4 cm., and a portion of the base of the tongue likewise had to be excised. Under these circumstances, the conditions for suturing the pharynx were of course very unfavorable. Nevertheless, although on the sixth day the presence of mucus in the wound gave proof that a portion of the wound had given way, the after-treatment, particularly as regards the change of dressings, was so simple that the difference between this case and former ones was marked.

The healing of the wound progressed without any disturbance. The pharynx fistula closed after four and one-half weeks, and the patient could again swallow both fluid and solid food. At the same time the gastrostomy tube was removed, and the gastric fistula closed promptly without leaving a drop.

The addition of a gastrostomy to an extirpation of the larynx does not add very materially to the severity of the operation for the laryngectomy is done as I have lately always performed it under local anaesthesia. In such advanced cases the severe dyspnoea forbids operating under general anaesthesia unless one has chosen to perform a preliminary tracheotomy. This, however, one will prefer to avoid in the interest of asepsis. For local anaesthesia I employ a one-half per cent solution of novocaine with suprarenin, deep injections being made to anaesthetize

¹ Patient and specimen were presented at a meeting of the Surgical Section of the New York Academy of Medicine December 2, 1911 and before the Laryngological Section on December 24, 1911.

the trachea and larynx, and superficial ones for the overlying soft parts. The deep injections are four in number on each side. The first, which is to block the superior laryngeal nerve, is made between the hyoid bone and thyroid cartilage into the thyrohyoid membrane 3 cm from the median line. The incisure of the larynx serves as a guide to the median line. The other three injections are made at point farther down to reach the posterior part of the larynx and trachea. For these a curved needle is of advantage. One of these is made behind the cricoid cartilage another below the isthmus, and the lowest one in the region of the jugular notch. At least 5 cc. of the solution is injected at each site the injection beginning at the deepest spot and being continued the needle is drawn for

ward. Superficial injections are then made corresponding to the lines of incision. I employed a T-shaped incision. The operation itself is made according to Chuck's well-known method, with transverse division of the trachea and suture of the tracheal stump to the skin in the jugulum.

When the laryngectomy has been completed the patient, who now breathes again with perfect ease can readily take an inhalation narcosis through the tracheal opening for his gastrotomy. Of course it is also possible to perform the gastrotomy under local anesthesia.

This little addition to the technique of laryngectomy I feel sure will prove to be of good service in many difficult and extensive cases.

MASSIVE X-RAYING IN GYNECOLOGY

B. HENRY SCHMITZ, A. M. M. D. CHICAGO

THE treatment of uterine hemorrhage with the X-ray has been little practiced in this country and almost ignored in American medical literature. Massive X-raying on the other hand has become the most important subject of the hour in gynecology in continental Europe. The literature already is full of reports of its results and progressive development of the technique.

The reason for this neglect probably lies in the fact that those operations must be discarded which for decades have been the most brilliant and successful of gynecologic operations. It also was difficult for the gynecologist to acquire the complicated technique of X-ray treatment the execution of which, besides, requires a good deal of time. This work should not and could not be left to the radiologist. He could not compare the results of roentgenotherapy with the usual methods of gynecologic treatment and is not able to formulate the necessary limitations for the indications (1).

Albers-Schönberg published in 1903 a paper about an until now unknown action of the roentgen-rays on the animal organism, in which he described an oligo- and azoospermia produced by the action of X-rays in the testicles of rabbits. This paper became at once the fundamental work for gynecologic X-ray therapy. In 1905 Halberstätter (2) extended this knowledge to the female genital glands and thereby estab-

lished the intents and purposes of the modern roentgen treatment of gynecologic diseases.

The results of the research work in the rabbit were as follows: Macroscopically a marked diminution in size of the rayed ovary in comparison to a normal ovary was apparent. The microscopic findings showed an atrophy of the graafian follicles and later on of the primary follicles and ova. Specht (3) added to this the still more important discovery that the interstitial ovarian stroma perishes by the action of the X-rays, an atrophy of the cells and a degeneration of their protoplasm occurring. Zaretzky (4) confirmed these findings and laid stress on the fact that the ovarian atrophy is not necessarily permanent if the amount of administered rays is not particularly large. If only one ovary in an animal is rayed, the corresponding uterine horn also atrophies. The administration of one large amount of rays is more effective than the same amount of dosage given in several interrupted doses. These conclusions form the foundation for the temporary sterilization by means of the X-ray and demonstrate the advantage of crowding the application into the shortest possible space of time.

The following consideration demonstrate the fact that the action of the rays on the human ovary does not differ from that on animal female genital glands. In 1907 Vera Rosen (5) reported the results of examinations of human ovary

which had previously been exposed to the röntgen rays. She found a decrease in the number of primary follicles and a marked atresia of the follicles. In 1910 Reifferscheidt (6) published such examinations. He rayed six women before operations. They were 35 36 37 39 40 and 51 years of age and received on an average $\frac{1}{2}$ to $1\frac{1}{2}$ erythema doses. The examinations showed degeneration of the ova in all the follicles of the follicular epithelium and the connective-tissue cells of the theca interna, and small capillary hemorrhages in the cortical layer between the cells of the stroma. In 1910, Faber (7) reported another such case, in 1911 Runge (8) one case and in the same year Eymor and Wolff (9) seven such cases. Their findings were identical with those previously described.

The action of the massive rays depends on the technique and the therapeutic indications and results. It does not matter what kind of instruments one uses. I employed a coil with an electrolytic interrupter in my first work. It was soon discarded because it required continued attention. I am at present using a Snook interrupterless machine which renders good service and is easily handled in spite of severe and hard usage. The future will demonstrate whether the Snook apparatus is harder on the tubes than a coil.

Water-cooled tubes are used exclusively in my work. The water-cooling of the tubes is attained by a continued flow of cool water. The tubes are provided with an osmoregulator. The action of the rays of a tube depends on the degree of hardness of the tube, the filtering of the rays, the distance of the anode from the skin, i.e., the focal distance, and the time concentration of the application of the rays (10).

The rays are the harder and more penetrating the higher the vacuum of the tube. A measuring of the degree of hardness of the tube is therefore necessary. I determine the hardness of the tube with the qualimeter of Wehnelt and control its constancy with the qualimeter of Helix Bauer.

The principle of the Wehnelt qualimeter depends on the comparison of an exposed piece of silver with a wedge of aluminium which is moved along the silver piece on a fluoroscope. Christen (11) determines the hardness of the tube with a half value meter. The latter enables one to find that depth of distilled water which reduces the intensity of the rays under investigation by one half. Table I gives a comparison of the values of the most commonly used qualimeters.

TABLE I

Christen's half value meter	2	4	6	8	10	12	14	16	18
Wehnelt	2	4	6	8	10	12	14	16	18
Helix Bauer	2	4	6	8	10	12	14	16	18
Bauer	2	4	6	8	10	12	14	16	18
Walter	2	4	6	8	10	12	14	16	18
David Lammertson	very soft	soft	hard	very hard					

*Indicates that value is less than number given.
Indicates that value is higher than number given.*

According to Christen that quality of rays is best, five-eighths of the energy of which is absorbed in the soft tissues lying above the organ or structure to be rayed, so that three-eighths of the energy of the rays penetrate to the desired depth. This requirement is accomplished by a quality of rays the half value measure of which equals the thickness of the soft tissues which lie above the organ to be treated. The position of the ovaries beneath the skin surface of the anterior abdominal wall varies between $\frac{1}{4}$ and $\frac{3}{4}$ cm. its mean amounting to 6 cm. (12). Therefore it follows that the half value measure of the rays used for gynecologic purposes must be at least $\frac{1}{4}$ cm. or more. Such a degree of hardness, however cannot at present be produced. The half value measure of a röntgen tube of the usual construction used as hard as possible, is about 1.4 to 1.6 cm. The energy of this ray is reduced to $\frac{1}{16}$ at the depth of the ovaries, which is 6 cm. Therefore, $\frac{1}{16}$ of the energy is lost by absorption during the penetration of the 6 cm. However the half value measure of the rays can be increased by the interposition of a filter as is shown in Table II (13).

TABLE II

Hardness of rays through an aluminium filter

Thickness of filter, in mm.	1	2	3	4	5	6	7	8	9	10
Half value measure, cm.	1.2	1.5	1.8	2.2	2.5	3.0	3.5	4.0	4.5	5.0
Unfiltered										

The greatest increase in hardness of the rays is attained by the use of an aluminium filter 4 mm. in thickness, the half value penetration increasing to 2.5 cm. In other words, the unfiltered rays lose $\frac{1}{16}$ of their intensity by the time they reach the ovaries, and only $\frac{1}{4}$ if they have been filtered.

Filtered hard rays, according to Gauss and Lembke (14) possess also the valuable and

additional advantage of protecting the skin from X ray injuries. Skin injuries could not always be avoided by the use of an aluminum filter up to 2 mm. thickness and a focal distance of 20 cm. However if a 3 mm. filter is used under the same conditions, and an erythem dose is then applied, injuries to the skin were not observed in many thousand applications. The dose of the filtered rays may be increased intentionally or unintentionally even up to 4 erythem doses without injuring the skin becoming apparent. Of course we must consider that 10 % of filtered rays represent an entirely different amount of energy than 10 % of unfiltered rays. But 10 % filtered rays exceed the same amount of unfiltered rays in deep penetrating action and biologic effect although the erythem dose of the filtered is higher.

The unit of X ray measure is the erythem dose which, when applied to the skin causes slight inflammatory irritation a dose of half. As the period of latency of the X ray action amounts to fourteen days, it is apparent that the normal amount per month is the application of two erythem doses of unfiltered rays to the given region.

X rays produce a change in color of barium platinum cyanide. The latter is applied to a disc which is placed at the half focal distance and exposed to the action of the rays. It is then gradually discolored brown. The skin has received an erythem dose when the discoloration of the disc corresponds to a test color. Hols knecht has devised a color scale. Five H correspond to one erythem dose or 10 %.

Another protection of the skin is, finally the application of the rays through a number of fields (5). An amount of rays injurious to the skin is equally divided, the divided dosage is sent into the body through several fields or portals of entry and the tube is tilted so that the rays will strike the same place in the interior of the body.

It is certainly not of time to mention all the different methods of massive ray treatment. In describing the method, the focal distance, the amperage of the secondary current, the hardness of the tube, the duration of the treatment, the filter used and the number of fields must be given. If any of these six points is omitted, the record of the remaining points is useless.

Two extremes in the methods of deep raying exist. The one introduced by Albers-Schönberg, advocates a moderation in treatment the other, fathered by Gauss, insists on a radical, intensive method — *mehrstellige Filterabstrahlung*. It is characterized by filtering of the rays

through an aluminum sheet of 3 mm. thickness, a focal distance of not more than 20 cm., and a crossfire action through the greatest number of portals or fields possible.

Albers-Schönberg uses a tube of 6-8 Walter, the secondary current is 3 to 4 m. amp. the focal distance is 38 cm., and the filter consists of four layers of goatskin leather each of 1 mm. thickness. The intestines are displaced by a compression tube. The latter also compresses the skin. The methods for massive raying are two, a slow and an accelerated tempo (16). The former consists of a dose of six minutes on three successive days, which constitutes a series, an intermission of fourteen days, then another series etc. The latter method employs a series through the anterior abdominal wall eight days intermission, then another through the back, eight days intermission, another through the anterior abdominal wall etc. An X ray dosage of $7\frac{1}{2}$ % is not exceeded during any one sitting. Therefore, two erythem doses are never given to any one region of the skin during a month. The treatment is immediately stopped as soon as a skin reaction appears or the purpose of the treatment, be oligo- or menorrhoea, has been attained, so that no more rays are used than are absolutely necessary.

The Friesburger or Gauss (17) method is executed as follows. The focal distance is 20 cm., the milliamperage of current 5 to 12 the filter aluminum, 3 mm. thick the hardness of the tube 9.5 to 10 Wehnelt, the number of fields 40 to 60, the amount of rays in a series of six sittings 300 to 600 %, the average amount of dosage of the treatment being 1475 %.

My method attempts to keep within the middle of these two extremes. I use a focal distance of 20 to 22 cm. a tube of 9 to 10 Wehnelt, a current of 4 to 5 ma. an aluminum filter of 3 mm. thickness. The number of fields amounts to 6 to 10 depending on the size of the abdomen and that of the pelvic organs. Each field measures 5 sq. cm. and is exposed twice during a series of 10 daily sittings. The amount of dosage per field varies from 8 % to 10 %. The total amount given during one series, from 20 to 240 %. An intermission of three weeks is taken between series. The skin is compressed by a tube and the intestines are displaced, as much as possible by a slight elevation of the pelvis.

Gauss claims the following advantages for his method: 100 per cent cures, shortening of the time of treatment to an average of five weeks. Malignant changes in the uterus or ovaries can be early recognized on account of the short

duration of the treatment and therefore subjected to a timely operation. This invalidates any apparent opposition towards gynecologic roentgen treatment on account of a supposed delay or procrustation. Missed diagnoses, also are rendered less objectionable on account of the shortening of the time of treatment.

The accessory action of the X-rays are formation of connective tissue, Elselsberg (18) Henkel (19) Abel (20) Bunun (21) roentgen peritonitis with acute oedema, reddening, exudation, Klein (22) diarrhoea, injuries to intestinal mucous membrane, Haendly (3) Hengge (24) Wetterer, Bum (25) roentgen intoxication Krinaki (26) latent ulcer one year after treatment, Quervain (27) roentgen paralysis and absorption fever (Foveau de Courmelles (28) Haendly (29)) Röntgenologists who are or have been exposed to a summation of large amounts of rays often show changes in the blood, probably caused by an involvement of the bone-marrow and the entire lymphatic system, Köhler (30) These observations and deliberations must convince one that we do not as yet perfectly comprehend the biologic, temporal and local extent of the action of the X-rays. We are compelled to employ only the smallest possible amount of rays (31)

The most favorable time for the application of the rays in relation to the occurrence of menstruation is as soon as possible after the cessation of the period, especially if moderate doses of rays are to be used. Moderate dosage causes an irritation of the ovaries, which in turn, brings about an increase in the amount of the flow at the next menstrual period. Massive rays, however inhibit the function of the ovaries which is asserted by a decrease or complete cessation of the menstrual flow.

Finally we will consider the therapeutic indications. Those diseases are suitable for roentgen treatment which are caused by an abnormal function of the ovaries. Hirstein holds that if a diseased condition is benefited by a raying of the genital organs so that the chief symptoms disappear it originally must have been due to a disturbance of the ovarian function. As the ovaries almost exclusively cause uterine hemorrhages, the latter furnish the chief cases for the gynecologic X-ray treatment. It is clear that the nearer the patient approaches the natural climacterium or change of life, the easier the surer and the quicker may she be relieved of her hemorrhages. The climacteric, pre- and post climacteric hemorrhages, the so-called hemorrhagic metropathies, belong to this category.

The roentgen treatment of these hemorrhages must be preceded by a curettage. X-ray therapy is not a diagnostic but only a therapeutic agent. X-raying of chronic metritides with hemorrhages does not differ from that of the essential or idiopathic hemorrhages.

The indications and contraindications for the treatment of myoma by means of the X-ray differ according to the authors. Krönig and Gauss (32) very decidedly advocate the treatment of myoma by their intensive, massive method. The surgical treatment has ceased to be the procedure of choice in the treatment of myomata and hemorrhagic metropathies. The operative treatment is at present reserved for a few exceptional cases only in which, for various reasons, radiotherapy is apparently not suited. The radiotherapy is contra-indicated in the following instances according to Krönig (33)

1. Pedunculated submucous myomata already partly expelled through the cervix.
2. When gangrene is suspected in the myomata.
3. If the myomata are complicated by cancer of the mucous membrane.
4. Myomata in which we must suspect a sarcomatous degeneration on account of rapid growth severe metrorrhagias and unsuccessful roentgenotherapy.
5. Myomata which are causing an acute incarceration of the bladder.

The raying of the myomata must also be refused before the 35th to 40th year of life. While myomata with severe anemias, causing subsequent weakness of the heart and a hemoglobin percentage of 10 to 20 must be rayed by all means (Krönig, Gauss, Menge and Fränkel)

The indications, according to Menge, are as follows: 1. Myomata of older patients which cause symptoms without causing disturbances of health. 2. Myomata with rapid growth and general disturbances (anemia, disturbances of the circulatory and urinary organs) occurring in women older than 40 years.

Pruritus vulvae, dysmenorrhoea and inflammatory adnexal diseases have been successfully rayed. However the opposite holds good for inoperable malignant pelvic tumors. I have never seen a betterment of the subjective, much less of the objective symptoms after the most careful and painstaking treatments. This fact, however is not to be regarded as an unfortunate one as we possess therapeutic agents in radium and mesothorium, which, in all probability will enable us to successfully fight this dreaded enemy of the unfortunate bearers.

In conclusion, I repeat the warning of Menge,

made to his brother gynecologists, that they had better perfect themselves in the technique of this new treatment, for if they do not do so of their own accord, they will be compelled to do so by the demand of the general practitioners and the laity. If they resist, then the greater number of myoma patients will pass out of their hands into those of the radiographers, which would be a most unfortunate result, because of the difficulty in determining just which cases are suitable for X-ray treatment, and which should be subjected to operation—a diagnosis that can be made by a trained gynecologist only.

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A DOUBLE LEVER INSTRUMENT DEvised FOR THE OPEN REDUCTION OF FRACTURES

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TO accomplish the successful reduction of certain transverse fractures, especially supracondylar fractures often necessitates great trauma to the fragments and to the soft tissues. The operation is sometimes abandoned without a satisfactory replacement of the fragments.

The instrument herein described is devised to prevent unnecessary trauma and to permit an easy reduction.

It consists of three pieces, i.e. a lower stationary bar, an upper adjustable bar and a set-screw.



Fig. 3. The instrument in position preparatory to the leverage action caused by raising the handle. The curved end of the lower bar has engaged the fractured end of the lower fragment, the spur of the upper bar has been adjusted against the fractured end of the upper fragment and the set-screw tightened, maintaining it in this position.

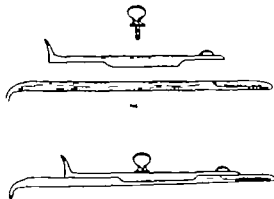


Fig. 4. The component parts of the instrument.
 Fig. 5. Appearance when assembled.

The curved end of the lower bar, serrated with the sharp edges slanting upward, is inserted between the upper and lower fragments, engaging the fractured end of the lower fragment. The spur of the upper bar, serrated, with the sharp edges slanting downward, is then adjusted against the fractured end of the upper fragment and maintained in this position by tightening the set-screw.

The handle being raised by slow steady pressure, a double lever action ensues, each fractured end acting as a fulcrum to the other. The lower fragment is forced distally and the upper fragment, proximally. The action continuing the

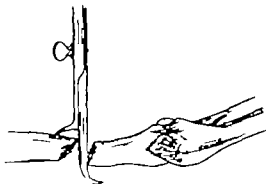


Fig. 5. The instrument in vertical position, having pushed the lower and upper fragments respectively distally and proximally. The lower fragment should be repositioned as resting in the curved end as its apparent position is obtained only by further downward pressure of the handle.

lower fragment is elevated and the upper fragment depressed until they are in direct alignment. Further action could cause complete reversal of the former relationship of the fragments.

When the fragments are in the desired position the instrument may be removed by a reverse action or in fracture of the long bones, may remain *in situ*, holding the fractured ends while a Lowman clamp is applied.

I am indebted to Dr. Alfred Braun for the illustrations.

HEAD INJURIES SOME CONCLUSIONS

By W. J. ANDERSON, M. D. CHICAGO

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DURING the year of 1912 there were 298 cases of head injuries admitted to the Cook County Hospital. These do not include the ordinary scalp wounds, numbering over 1000 cases, which are known as "dress cases" or dispensary cases.

Of these 298 cases admitted, 130 were diagnosed as skull fractures, 120 as scalp wounds, 22 as gunshots, 15 as cerebral concussion and 11 as infected scalp wounds.

Of the 130 cases of skull fractures, 72 were recognized as involving the vault and 58 were termed basal fractures. This classification was made by the examining room interne, and a revision due to more perfect and deliberate examining in the wards showed that in the main the initial diagnosis was correct. Of course it is to be understood that in a large number of the fatal cases the injury was so severe as to involve the base as well as the vault.

The diagnosis of fractures of the vault was made by direct inspection cutting down through the pericranium whenever necessary. Twenty-six of 72 recovered, making the mortality 64 per cent. Whenever a depression existed or where there was a linear fracture in the neighborhood of a meningeal vessel with focal symptoms or coma, a decompression operation was done. To tabulate

excepting where a depressed fracture involving the vault coexisted with a basilar fracture. To tabulate

BASAL SKULL FRACTURES

Admitted	Recovered	Died
Males	5	20
Females	5	4
Children		
Males		
Females		
	10	24

Fifteen cases were diagnosed as cerebral concussion, and all recovered. With these cases there were cerebral symptoms present with a history of injury. While no distinct focal symptoms were present pointing to any particular cerebral location, yet they were admitted as a safeguard for further observation.

Of the 120 cases of scalp wounds admitted as hospital cases 15 were males and 15 females. Most of these cases were partly under the influence of alcohol and a question of policy as to whether some of the symptoms might not be due to direct cerebral injury warranted us in admitting them as cases. That this policy was worth the extra expense to the hospital is shown in that 10 males developed active delirium tremens, 3 of whom died.

To tabulate the gunshots of the head

SKULL FRACTURES OF THE VAULT

Admitted	Recovered	Died
Males	50	58
Females	4	4
Children		
Males	3	3
Females		
	7	45

Of the 58 cases of basal skull fractures, 5 recovered, making the mortality 91.7 per cent. The diagnosis of each case was made by the presence of blood in one of the cavities of the head, as the nose, throat, or ears, and was confirmed in most instances by spinal puncture, the latter measure being a routine diagnostic procedure in every suspicious cerebral case. Instances have occurred where there was a negative finding as far as the presence of blood in the spinal fluid was concerned, yet there was blood present within the auditory canal, the nasal cavity or the pharynx. The treatment was expectant in each case

GUNSHOTS OF THE HEAD

Admitted	Recovered	Died
Males	7	6
Females	4	4
Children		
Males		
Females		
	11	10

Eight of these cases were non-penetrating. All lived and none developed tetanus, leaving 4 cases in which the bullet or bullets entered the calvarium. 1 of these died, making the mortality 86 per cent. One of these cases died of tetanus.

Eleven cases of infected scalp wounds were admitted. These in every instance had received their initial treatment by some physician not connected with the institution.

The infection was of such a degree that ordinary dispensary treatment could not be recommended.

In one of the cases two scissors blades at least $2\frac{1}{4}$ inches long were found embedded in the scalp. This man developed tetanus but fortunately recovered.

Death in head injuries is either due to (1) surgical shock, (2) meningo-encephalitis, or (3) bronchopneumonia.

Now what conclusions or points of value can one gather from collecting or observing these cases? It is not my purpose to discuss exhaustively the subject of the diagnosis and the surgical technique one may apply to head injuries. It is merely my intent to call your attention to some of the important points which have been of value to us in the treatment of head injuries as they were admitted to this institution.

The greater number of scalp wound cases will be found under the influence of alcohol and it is an exceedingly difficult problem to differentiate the symptoms due to alcoholism and cerebral symptoms due to injury of the cranial vault and its contents. We are frequently confronted with a case partly in stupor or in a coma with no previous history. The police bring him to the hospital. With no previous history the problem from a diagnostic standpoint becomes a very difficult one.

The most careful scrutiny for an abrasion of the scalp must be indulged in and most rigid examination resorted to. One should recall the pathological and chemical conditions which may produce coma. The surroundings of the patient should be noticed. Is there blood or vomitus near him? The depth of the coma should be ascertained. If possible the man should be aroused by supra-orbital pressure or by brisk rubbing of the ribs in the axillary line with the knuckles of one hand, and asked to give an account of himself. His tongue should be examined for bites or scars. The breath should be noticed. The amount of muscular power and the state of his reflexes should then be observed. Any inequality probably indicating a unilateral lesion within the cranial vault. The urine may be drawn off and examined for sugar or albumin. If there is any suspicion of poisoning the stomach should be washed out. Spinal puncture is of the utmost value, and in any case of doubt should always be resorted to. I am inclined to believe with Rothstein that it is never a dangerous procedure except in two conditions, i.e. brain tumors, particularly those of the cerebellum and in acute hydrocephalus with tuberculous involvement of the aqueduct of Sylvius. Ordinary precautions, however, should be used. It is not necessary to remove more than 15 to 20 cc. of fluid for

diagnostic or therapeutic purposes. The drop method should be used. For diagnostic purposes, if the fluid is not under tension 2 to 5 cm. is sufficient. The consistency of the fluid should be noted. Is it clear, turbid, bloody or does it contain flakes. Nearly all cases of cerebral injury have increased blood pressure. The slow pulse is characteristic in the early stages. It has been stated that the blood pressure apparatus may furnish an excellent guide as to the progress of a case with compression symptoms, and when used at the time of spinal puncture might indicate that sufficient fluid has been withdrawn. Those who have used this method state that a drop of ten degrees is a warning that enough fluid has been withdrawn. I have followed out these suggestions and have found them of no value.

The X-ray as a diagnostic measure is of value only in the hands of an experienced operator, one who has analyzed thousands of plates. No one should attempt to interpret a plate who has not studied the relationship between head injuries and the normal plate since there is nothing so deceptive as an X-ray plate. In the majority of cases at least four views of the cranium should be taken. As the part nearest the plate shows the clearest, a front-to-back, a back-to-front, a right-to-left and a left-to-right exposure should be taken. At times it is necessary to take from six to ten exposures to bring out a lesion of the cranial vault. A depression is rarely shown. Where bullets have entered the skull and the surgeon thinks it advisable to remove them, which question he should weigh with considerable thought after consultation with a competent neurologist, the X-ray plate should not be over an hour old and the operator should have measured the plates with the localizer to determine the precise position. The importance of this was shown to me in the late Bernstein murder case. This man received two bullet wounds, one entered the back in the lower left scapular region, had an oblique upward path about 30° and had its exit in the left neck above the clavicle; the other bullet entered the left occipital region and produced a right hemiplegia. The X-ray showed it lying under the vault in the left motor region close to the median line.

The man died shortly after 48 hours from the time of his injury. On the post mortem table the bullet was found at the wound of entrance in the occiput. He was posted within 12 hours after death, and it is a question whether the bullet gravitated through its path during life or after death. Such conditions of gravitation of bullets, according to LeCount, is by no means uncommon.

The probing of recent wounds for diagnostic purposes is recognized as a dangerous process. We believe with Lejar that it is a dangerous and an illusory practice." Frequently I have watched junior internes probing a scalp wound for the possibility of fracture. They would feel fairly certain that a fracture existed. Advising them to cut down through the pericranium, retract the same, the skull would be found in the great majority of cases smooth and regular. The pericranium should be incised and the skull examined by direct inspection in every case in which there is the remotest suspicion of cerebral injury. That is where a scalp wound or a hematoma is present. I recall the case of a charity worker who had been hit by some vehicle. She was brought to the hospital by the police, in coma. No history of consciousness between the time of the accident and the appearance of the coma was obtainable. It could not be determined whether any paralysis existed except that one pupil was dilated. On the side of the dilated pupil in the parietal region was a large hematoma. Cutting around the hematoma as for a horse-shoe flap and reflecting the pericranium, a linear fracture was found. Proceeding with a decompression operation an extradural clot which extended, it seemed, over the entire right hemisphere was found. It appeared to be over one-fourth of an inch in thickness. Removing the greater part of the clot the source of the hemorrhage was found to be the anterior branch of the middle meningeal artery. Fortunately it was an easy matter to ligate by passing a needle with catgut under the dura mater. Gause drainage was used and the scalp sutured with its pericranium. Upon the completion of the operation both pupils were equal. No anesthetic was necessary. The woman made a complete recovery returning to consciousness after 48 hours, and to-day after a lapse of six months, enjoys good mental and physical health. I have had two other cases similar as to the physical findings in that a hematoma existed on the same side as the dilated pupil. Yet one should not place too much reliance upon these findings, for cerebral symptoms without other focal findings are not to be relied upon.

The question as to how to treat the dura mater in the acute traumatic cases is a good field for

discussion. Should one for exploratory work make the crucial, the elliptical, or use any incision long enough to require suturing? Personally, I believe no incision large enough to require suturing should be made for exploratory work. Should one upon exposing the dura find that the spaces underneath it show increased tension or that there is an absence of pulsation, then small linear punctures with the point of the scalpel should be made. Should these punctures show the presence of blood, then one may continue this incision and proceed to explore the cortex, giving the patient the full benefit of a decompression operation by removing a section of dura mater. To liken the subdural space to the peritoneal cavity and that it may be drained in like manner I believe is a fallacy. Likewise to tap the lateral ventricle in an acute traumatic cerebral condition, so that one may relieve hypertension, I believe accomplishes nothing. I have seen one such case treated a small rubber tube was inserted into one of the ventricles—at least the operator thought he had the tube in the ventricle. The post-mortem showed that the tube had not been within one-fourth of an inch of the cavity. It is said that brain hernia does not occur without infection. I cannot recall a traumatic cerebral case where a decompression operation was done that did not show symptoms of infection. Then why should we make it a routine practice to make large incisions of the dura mater?

In conclusion, our mortality on the expectant plan for basal skull fracture during the year 1919 is shown to be 56.9 per cent. Should one continue by examining the histories of 1,000 cases of basal skull fracture, I believe the percentage would be much better. This brings the question for ward as to when basilar fracture should be operated upon.

It is my belief that the expectant plan is the best, and that the only indication for a decompression with a positive diagnosis of a straight basilar fracture is, that after the patient has been under observation, with the coma and temperature the same the pulse is found to advance from 40, 60 or 80 to 120 or more. Spinal puncture, when used intelligently accomplishes about as much as decompression operation in basilar fractures.

BOOK REVIEWS

A CRITIQUE OF NEW BOOKS IN SURGERY

By M. G. SEELIG, M. D., SAINT LOUIS, MISSOURI

NOT since Osler's work on abdominal tumor has anything appeared approximating in significance this large monograph by Professor Schmidt, and nothing mirrors more accurately the deplorable overshadowing of intrinsic surgical thought by surgical technique—the science by the art of surgery—than the fact that such productions as this one are so commonly finished by internists, and so rarely by surgeons. Even he who has not enjoyed the privilege of working with Schmidt readily may appreciate the comment of the translator Dr. Joseph Burke, regarding the almost uncanny diagnostic ability of the author.

The monograph is arranged in three parts, divided respectively into (1) General Considerations such as the technique of physical examination, histological microscopy and general symptomatology; (2) Neoplasms of Special Abdominal Organs; and (3) Case Histories. A careful reading of the first few pages of Part I suffices to make plain that after all Schmidt's diagnostic skill possesses nothing of the element of the uncanny, but rather rests upon the very solid basis of highly refined power of detailed observation, combined with admirable capacity for inductive reasoning and incomparably well-developed associative processes of thought. This striking combination is emphasized all the more strongly by Schmidt's tendency throughout the monograph to place sole dependence upon the concrete facts and phenomena of pure medicine to the exclusion of the cognate sciences. I thus remember the English school of clinicians contrasted with such men as Krehl, Kraus and von Norden on the continent.

A detailed study of cachexia, of the significance and sites of occurrence of seemingly slight edemas of abnormalities in skin and hair coloring, of the varying types of emaciation and of subtle alterations in temperament furnishes the reader mass of fundamental knowledge without raising the suspicion of academic refinement.

Likewise in the second part of the monograph devoted to the special consideration of neoplasms of the stomach, liver, gall bladder, pancreas and kidney there is wealth of observation and of minutiae that must be startling to the average clinical mind and that would be confusing were it not for

the orderly manner in which the facts are developed under the several heads, as follows: Early symptoms accompanying symptoms, facts elicited by physical examination of the stomach, accompanying symptoms from other organs, clinical microscopical findings, types of disease, with course and duration, and finally suspicious factors and differential diagnosis. It is a matter of no small interest that such a fund of data can be presented in such form as not even to graze the edge of the encyclopaedic. A concrete example may possibly serve to show how Schmidt uses his facts not for the purpose of classification, but rather for the elucidation of phenomena. Thus, under the head of general considerations, he shows that the majority of patients who suffer from cancer of the stomach are descended from long-lived parents, and have themselves a clean past history—one, indeed, of excessive well-being. Later under the special head of cancer of the stomach, he notes the extreme rarity with which alvular lesions of the heart accompany gastric carcinoma, and he ventures an explanation on the basis of the excellent previous health of these patients who so rarely suffer from those infectious diseases that predispose to endocarditis. Again, the repeated kind of atrophic spleen in gastric carcinoma patients who come to autopsy moves Schmidt not to classify the fact as one of pathological significance, but rather as not inconsiderable aid in differentiating carcinoma of the stomach from the often confusingly similar pernicious anemia in which the spleen is usually large.

The third part of the monograph, devoted to case histories, presents in condensed and yet adequate form one hundred and seventy-five case reports each one of which illustrates some point brought out in the preceding text. One notes with surprise the statement, I have never observed metastases in the inguinal glands (with carcinoma of the stomach). Evidently in spite of close observation of the richest possible material, Schmidt has not seen secondary involvement of the umbilicus with consequent inguinal metastases—a symptom complex which although it may not be common does occur and furnishes clinching evidence of visceral and particularly of gastric carcinoma.

Of course, one may diagnose, treat, and even cure some abdominal tumors, without commanding the mass of facts presented by Schmidt, just as one may be a clever musician without knowledge

of the intricacies of harmony and counterpoint and yet it would be difficult to single out one fact in the book as unessential.

THIS the December number of the *Murphy Clinics*, calls for special comment from several different points of view. In the first place—and praise be therefore—the editing of this volume is incomparably better than has been the editing of the volumes issued in the past. In the second place there is recorded a particularly admirable variety of case histories dealing with surgery of the gall bladder, lung, osseous system, kidney, spinal cord, joint and bernalia. Thirdly there is a clear and lucid exposition of the treatment of pulmonary tuberculosis by the production of artificial pneumothorax as practiced by Murphy and a first recommended by him in 1893.

The wisdom of the policy of republishing in the *Clinics* a paper written by Murphy sixteen years ago may properly be questioned, and yet one readily understands the promptings leading to such an addition to the *Clinics*. Regarding the appended list of cases operated upon by Murphy before the Clinical Congress of Surgeons it is more difficult to form a judgment. It so believes that such list, with notations of the geographical distribution of the patients, offends a canon of good taste, almost certain to be more or less fastidious to his belief. A comparison with the noise of bells and cymbal is not far from hand. And yet such details are essentially trivial if one concentrates on the inherently and may even say unduly close surgical reasoning, clever technical differentiation, and masterly command of ethical facts that fairly crowd the column.

THIRTEEN excellent papers on the vascular system written by Bernheim during the past few years are gathered and elaborated in this small monograph, which in ten chapters deal with the general technique of blood vessel surgery, transfusion, end-to-end suture, lateral anastomosis, transplantation of segment of veins and arteries, arteriovenous anastomosis, varicose veins, surgery of the heart and neuritis.

So many of the worthy medical contributions of to-day may be found in monograph form that we have learned to discount this type of medical thesis as an expression of personal opinion, experience and critique. It is to be regretted therefore that Bernheim does not confine himself to that part of blood vessel surgery which has engaged his own personal activities. The inadequately short and inconsequential chapters on aneurysm, cirs and nature of the heart and the rather bibliographic chapters on atherosclerosis serve only to detract from the excellency of the preceding chapters.

The reviewer an testify from personal experience

to the absolutely essential importance of all the minute details of technique insisted upon by the author, but he has never yet been able to bring himself to the use of the Bernheim tubes or of any other intermediate apparatus, in the performance of transfusion. Anyone who has done much work in recording blood pressure in animals knows that even with the smoothest clearest, and best perfused carotid cannula clotting unavoidably occurs. It could hardly seem wise therefore to discard the valuable latima-t latima principle as a routine measure unless urgent haste demanded an indirect transfusion by means of tubes, syringes, or glass containers of the Kimpton type.

Especially sane and rational is Bernheim's counsel to make careful hematolytic tests of donors and recipient blood only when proper facilities are at hand and when urgency is not a factor but to forego these tests, with equanimity when urgency is a factor and when physical examination of donor and recipient points to no potential serious consequences.

The monograph is excellently illustrated, and would serve as a handbook for those unskilled in the art of transfusion, and, in particular, a manual for those who seek to perfect their technique in the laboratory, the only place where the technique can be adequately mastered.

MORE than four years have elapsed since the first volume of Deaver's and Ashhurst's *Surgery of the Upper Abdomen* appeared, a delay which the authors take to be due to the fact that so great a mass of literature had to be gone through a delay however which makes the second volume necessarily more up to date than is the first. This second volume made up of nine chapters, which are divided so as to consider in order under separate heads the various diseases, tumors and injuries of the gall bladder and biliary ducts, liver, pancreas, and spleen, with final chapter on the technique of the various operative procedures applicable in the surgery of these various organs.

As a whole the volume mirrors thoughtful consideration of and selection from mass of literature, as well as an excellent correlation of the facts finally selected. Chapter I for instance there is an admirable dissertation in which the general subject of jaundice is discussed in the form of short, snappy paragraphs containing all the really valuable information furnished by recent current literature. Likewise the topic of gall stone formation is presented in brief concise, and thoroughly adequate fashion, so that one may weigh rationally the evidence in favor of stagnation or of infection as etiological factors. The chapter on the pancreas is illuminated by particularly lucid description of cut pancreatic tissue in which Deaver has had an enviable large clinical and operative experience.

RECENT LECTURES OF JOHN B. MURPHY. Philadelphia and London: W. B. Saunders Company.

LECTURES ON THE VASCULAR SYSTEM. By WILLIAM M. BERNHEIM, M.D. Philadelphia and London: J. B. Lippincott Company.

EDITED BY DR. FREDERICK H. DEVEREUX. By JOHN B. DEVEREUX, M.D., and JACQUES ASHURST, M.D. Vol. II. *Surgery of the Gall Bladder, Liver, Pancreas, and Spleen*. Philadelphia: F. B. Rothman's Son Company, Inc.

Many who have read the crisp and oftentimes rather sharply dogmatic papers of Deaver will miss, in this volume, the strong personal note so characteristic of him in his interpretation of symptoms as well as in his setting and execution of operative indications.

Only here and there does one meet with unqualified advice as to what a certain symptom-complex means, what must be done to meet it, and when and how it must be done. The book has a more academic tone as is testified to by the numerous references following each chapter or for example, by the statistical résumé (p. 133) of all the reported cases of choledochus end-to-end suture, choledoch-enterostomy, hepatico-enterostomy and hepatico-cholelango-enterostomy. The size of the volume naturally limits its scope and as a result the attempt to crowd in too much data results disastrously in places, as for instance in the attempt to crowd a discussion of the moot points of the physiology of the spleen into three and half pages. Limits of space are also in all probability responsible for the omission under the chapters on Spleen,

of a discussion of the large cell type of splenomegaly (Gautier type).

Indeed, there is a palpable evidence of crowding and curtailment in many places where one naturally demands fuller information. The symptomatology of traumatic liver abscess and of amoebic abscess is developed and completed in ten or twelve lines, and nowhere is the symptom of pain described in such fashion as to accord it the place it merits as a cardinal differentiating symptom in visceral disease. When one considers the description of pain furnished by Deaver and Aabhusst in the light of contrast with Moynihan's description of this invaluable symptom, the comparison approaches the invidious.

The chapter on technique is admirably clear and sufficient and particularly valuable because here the personal note rings loud and true. Under this head one notes that although the authors have described the transverse abdominal incision of Sprengel, they do not recommend its use, even in splenectomy where it serves a most excellent purpose in cases of traumata to small spleens well bound down by old or recent perisplenetic adhesions.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

PHARMACOLOGY CLINICAL AND EXPERIMENTAL. By Hans H. Meyer M. D. and R. Gottlieb M. D. An abridged Translation into English by John T. Jor Halkey M. D. Price, \$6.00 Philadelphia and London J. B. Lippincott Company 914

DER CHIRURGISCHE OPERATIONSLEHRE. By Professor Doctor Viktor Schencklen. Price 6 marks Leipzig Johann Ambrosius Barth, 914

THE INTERVENTIONAL FORAMEN. By Harold S. O-

berg. Price \$3.00. Chicago Chicago Scientific Publishing Company

DIAGNOSIS IN THE OFFICE AND THE BEDSIDE. By Robert Amory Hare, M. D. B. Sc. Philadelphia and New York Lea & Febiger 914

INSTRUMENTS OF THE HAND. By Allen B. Karsavel, M. D. Price \$3.75. Philadelphia and New York Lea & Febiger 914

LEHRE VON DER CHIRURGISCHEN OPERATIONSLEHRE UND DER HUND KLINISCHEN BEOBSACHTUNGEN FÜR ARZTE UND STUDIRENDE. Vols. and By Professor Doctor Felix Krone and Dr. Emil Heymann. Berlin Urban und Schwarzenberg 913

DIETETIK UND NUTRITION. By Doctor August Ritter on Reims Berlin John Springer 914

CORRESPONDENCE

STAMM'S GASTROSTOMY

The *Medical News* September 2, 1904, contained an article written by me under the title "Gastrostomy by New Method." After reviewing the methods of Hahn, Girard, Kocher and Witzel, I said: "Some experiments upon dogs suggested to me a plan of procedure based on sound anatomical principles and which if not better than Witzel's method is at least equally

as good. In the dog the result has met every point it was *a priori* intended to accomplish. The first steps of the procedure are the same as in Witzel's method, an incision about three inches long being made along the left border of the ribs. The point of introduction of the rubber tube is marked with the knife by a slight incision simply through the serous coat of the stomach. Around

this point as a center, and at a radial distance of a little over one inch, a purse-string suture is introduced by means of a straight needle and strong silk, and including only the serous and muscular coats of the stomach. Next, the opening in the stomach for the rubber tube about the thickness of No. 15 American scale catheter is made, and the tube is fastened by a silk or catgut suture. The purse-string is now drawn together and there results a double sphincter which will guard against any leakage from the stomach. With about six interrupted sutures I stitch the stomach to the parietal peritoneum, and both ends of the purse-string suture, which so far served to hold steady the stomach, are now armed with needles and passed through the entire thickness of the abdominal wall on both sides of the wound and then tied in a loop. This arrangement will anchor the stomach firmly in position and the suture can be removed in eight or ten days. This description was accompanied by an illustration showing the tube and purse-string suture. The *Zentralblatt für Chirurgie*, No. 49, p. 202 1894, gave a short description of it. Short mention is also made in

Bryant's Operative Surgery 1901 Binnie, in his Operative Surgery also mentions it under the name Stamm-Kader operation. The fact is that Kader of Germany published a method in *Zentralblatt für Chirurgie* July 11, 1896 nearly two years after my publication, which had one point in common with mine namely the perpendicular insertion of the tube but he used interrupted sutures.

Later on, some authors used the purse-string suture and gave Kader credit for it, i.e. Kocher and Bier in their works on operative surgery. Moynihan, in Kelly-Noble's Gynecological and Abdominal Surgery describes and pictures a method which deviates very little from the one I published, and calls it Senn's method. Hermann Fischer of New York in *Zentralblatt für Chirurgie*, No. 47 1913 speaks of a Kader Senn gastrotomy. I am unable for the present to find out what technical steps this joint method represents. About two years after publication of my method, E. J. Senn described a method in the *Journal of the American Medical Association*

p. 1143, November 28, 1906, with the following steps. The stomach is seized as near the great curvature as possible and a cone is formed by an assistant, who holds the apex with his fingers or thumb forceps. Two puckering strings of heavy chromicized catgut are placed parallel to each other about two and one-half inches below the apex of the cone these sutures include the serous and muscular coats of the stomach. These sutures are next drawn taut and tied forming a constriction or neck. This end may also be accomplished by folding the stomach by Lambert sutures, but requires more time. Next a portion of the gastrocolic omentum is brought up and a cuff is sutured with fine silk over the constriction. The second stage is done at this time or can be deferred forty-eight hours, until adhesions are formed. This consists of an incision about one-half inch in length in the center of the portion of the stomach exposed. A rubber tube is inserted through this opening into the stomach. The stomach wall is now inverted, forming a circular valve. The incision is secured by Lambert sutures of silk etc.

If I understand this method correctly the cone is not inverted into the lumen of the stomach but simply the lips of the apex, after the incision are turned into the lumen of the cone outside the constriction. William J. Mayo seems to understand it in the same way, as he wrote to me a short time ago saying "Your method is an exceedingly valuable one, and, so far as we know is used more than any other. I find it very often erroneously referred to by a good many men as the Senn method. If you will remember Senn's operation consisted of a nipple toward the outside instead of toward the lumen of the stomach."

It is not my intention to enter into a war of priority or to detract from the merits of the methods of other men. But for the sake of historical accuracy and since it is the fashion to connect the name of the originator with his method of operation, I think gastrotomy with vertical insertion of the tube and inward folding of the cone of the stomach, with purse-string suture, should be called Stamm's gastrotomy as no other similar method was made before.

31 STAMM, 31 D. Fremont Ohio

Clinical Congress of Surgeons of North America

FIFTH ANNUAL SESSION

LONDON ENGLAND

WEEK OF JULY 27 1914

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THE LONDON CLINICAL CONGRESS

TO the surgeons of the Continent of North America the Clinical Congress, its purposes, and its method of conduct are well known. To the surgeons of London the Provinces, and the Continent, it probably appears as just one more medical society to attend.

For the benefit of those who do not know that the Clinical Congress was organized to furnish an unfulfilled need in the conduct of medical societies and that in its methods of carrying out this important innovation it has appealed forcibly to the practical surgeons of one Continent, the following summary of the methods to be carried out in the London Congress is given in detail.

Instead of the time-worn daily sessions held in a hall of suitable capacity at which papers on scientific surgical subjects are read and discussed, those attending the Congress will be distributed, by a system of tickets, to all the principal clinical surgical operating rooms of London where they will witness operations performed by foremost surgeons of that city.

The London clinics will be so organized that those in attendance will be able to attend operative clinics and demonstrations continuously throughout each day of the week of the Congress from 9:00 A.M. until 5:00 P.M.

All clinics will be bulletined at two centrally located hotels, the Hotel Cecil and the Hotel Savoy one day in advance, and tickets for these

various clinics will be distributed at stated times, mornings and evenings, throughout the week.

The evenings will be occupied by illustrated addresses on surgery by eminent surgeons of America, the Continent, and the Provinces, who have been selected because of their special fitness to discuss some subject in surgery that is particularly pertinent to the live surgeon of the day. These addresses and their subjects will each be further critically discussed by some London surgeon, especially selected on account of his familiarity with the subject to which he is assigned. These evening sessions will begin at 8:30 o'clock and close at 10:45. There will be but three papers at each evening session and three discussions, each limited in time.

The surgeons who have already accepted assignments for the evening addresses are as follows:

Prof. Tuffier of Paris.
Mr. Henry Jellett, of Dublin.
Mr. Robert Jones, of Liverpool.
Sir William Osler of Oxford.
Prof. von Eiselsberg, of Vienna.
Prof. Krönig, of Freiberg.
Mr. Williams, of Birmingham.
Dr. John B. Murphy of Chicago.
Dr. E. Wyllis Andrews, of Chicago.
Dr. G. E. Armstrong, of Montreal.
Dr. C. H. Mayo, of Rochester.
Dr. J. F. Percy Galesburg, Illinois.

EVENING ADDRESSES ON THE SPECIALITIES

There will also be three evening sessions devoted to Laryngology to Otolaryngology and to Ophthalmology respectively at each of which three addresses on popular subjects will be delivered by Provincial, Continental, and American specialists, each subject to be discussed by a London specialist.

THE HOSPITAL PROGRAM

We are able at this time, to print but a small portion of the programs of hospital clinics. They will appear in full in our next issue.

PRELIMINARY CLINICAL PROGRAM

ST BARTHOLOMEW'S HOSPITAL

General Surgery

- SIR ANTHONY BOWLEY — Wednesday 3 Friday 1.30.
 MR. D ARCY POWER — Monday and Thursday 1.30.
 MR. H J WAKING — Monday and Wednesday 1.30.
 MR. W MCADAM ECCLES — Tuesday and Friday 1.30.
 MR. R COZYNS BAILEY — Tuesday and Thursday 1.30.
 MR. L NATHAN RAWLING — Thursday 1.30.
 MR. G L GARR — Thursday 2.30.
 MR. C GORDON WATSON — Monday 3.30.
 MR. HAROLD W WILSON — Monday 3.30.
 MR. W GILLINGHAM — Wednesday 1.30.

Gynecology

- DR. W S A GRIFFITH — Monday Wednesday and Friday 1.
 DR. H WILLIAMSON — Thursday 9.30.
 DR. J BARRIS — Tuesday 9.30.

Orthopedic Surgery

- MR. R C ELSLIE — Monday 3.30 Tuesday 1.30.

Ophthalmic Surgery

- MR. W H JESSOP — Tuesday 1.
 MR. W H LEECH SPENCER — Thursday 1.

Throat Surgery

- MR. W D HARMER — Monday 1.30 Wednesday and Friday 1.30.
 MR. J A ROSE — Tuesday 1.45.

Aural Surgery

- MR. C E WEST — Monday 3.30 Wednesday 9.
 MR. SYDNEY SCOTT — Thursday 9.

- MR. H B ROBINSON — Monday Wednesday and Thursday 1.30 Tuesday 9 to 2.

- MR. CUTBERT WALLACE — Monday and Thursday 1.30.

- MR. F M CORNER — Wednesday 9 to 1 Thursday 1.30.

- MR. PERCY SAUNDERS — Wednesday 9 to 2.

- MR. CYRIL NITCH — Tuesday 9 to 1 Friday 1.30.

- MR. J E ADAMS — Monday and Thursday 9 to 1.

Gynecology

- DR. WALTER TATE — Tuesday 1.30 Thursday 9 to 12.

- DR. JOHN FAIRBURN and DR. J F NEEDLEY — Days and hours to be announced.

Ophthalmic Surgery

- MR. J B LAWSON and MR. J H FISHER — Days and hours to be announced.

Vocal and Throat Surgery

- MR. W G HOWARTH — Monday and Thursday 9 to 1.

Aural Surgery

- MR. H J MARRIAGE — Wednesday 9 to 1 Thursday 1.30.

Demonstrations:

- Demonstration of Prostatic Specimens, MR. CUTBERT WALLACE, Thursday 4.

- X Ray and Electro-Therapeutics, DR. A D REID.

- DR. W R BRISTOW and DR. CLAUD GOULDEN-BROOK, Monday Tuesday and Wednesday 9 to 1.

- Physical Exercises, MR. R T THORNTON Tuesday 9 to 1.

- Pathological Laboratory MR. S G BRATTON, Wednesday 9 to 1.

ST THOMAS' HOSPITAL

General Surgery

- MR. G H MARSH — Monday Wednesday and Friday 1.30.
 MR. W H BATTLE — Tuesday Wednesday and Friday 1.30.
 MR. C A BALLANCE — Tuesday Wednesday and Friday 1.30.

WESTMINSTER HOSPITAL

General Surgery

- MR. C STU. HAM — Wednesday 1.
 MR. W G S EAGER — Tuesday 1.
 MR. W TURNER — Thursday 9.
 MR. ARTHUR EANS — Friday 9.
 MR. E. ROCK CARLSON — Monday 9.
 MR. J M G SWAINSON — Wednesday 9.

Orthopaedic Surgery

MR. A. H. TURBY — Monday 3

Gynaecology

DR. G. H. D. ROYSON and DR. S. DODD — Friday 2

Ophthalmic Surgery

MR. C. HARTIDGE and MR. G. T. B. JAMES — Tuesday 9

Throat and Ear Surgery

MR. P. R. W. DE SAKTH — Thursday 2

GUY'S HOSPITAL

General Surgery

MR. ARBUTHNOT LANE — Monday Tuesday Thursday and Friday 2

MR. L. A. DUNK — Monday Tuesday and Friday

MR. J. J. STEWARD — Monday Tuesday Thursday and Friday 2

MR. C. H. FAGGE — Monday Tuesday Thursday and Friday

MR. R. J. ROWLANDS — Monday Tuesday and Friday

MR. P. TURNER — Monday 9 Tuesday Thursday and Friday

MR. E. C. HUGHES — Monday Tuesday Thursday and Friday

MR. R. DAVIES-COLLEY — Monday 9 Thursday 2

Gynaecology

MR. G. B. SMITH — Wednesday and Friday 9

MR. H. CHAFFLE — Tuesday and Thursday 9

Orthopaedic Surgery

MR. W. H. TRETHERMAN — Tuesday and Friday 2

Genito-Urinary Surgery

MR. A. R. THOMSON — Monday 9

Ophthalmic Surgery

MR. H. L. LARON — Monday and Thursday

MR. A. W. ORMO — Tuesday and Friday

Throat and Ear Surgery

MR. W. M. MOLLISON — Tuesday and Friday 9

Clinical Demonstrations

MR. ARBUTHNOT LANE and MR. C. H. F. GOR — Cases of Intestinal Stasis and Fractures, Wednesday

ST GEORGE'S HOSPITAL

General Surgery

MR. G. R. TURNER — Tuesday and Thursday 3 to 4

MR. F. J. STREY — Tuesday and Friday 3 to 4

MR. H. S. PENDER — Monday and Friday 3 to 4

MR. T. CRISP ELLIOTT — Monday and Thursday 3 to 4

MR. W. FENDE FENDE — Thursday 9 to 5 Saturday 3 to 4

MR. IVOR BACK — Wednesday and Thursday 9.15 to 11 Saturday 1.30 to 4

MR. C. H. FRANKAU — Wednesday and Thursday 9.15 to 11

Gynaecology

MR. A. F. STARR and DR. G. F. DARWELL SMITH — Monday and Friday 9.15 to 10

Ophthalmic Surgery

MR. H. BARR GRIMSDALE and MR. G. T. BROOKS-BANK JAMES — Wednesday 1.30 to 4 Saturday 9.15 to 11

Throat and Ear Surgery

MR. H. S. BARWELL — Tuesday 9.15 to 11 Wednesday 2.15

Demonstrations

X Ray and Electro-Therapeutic Department, by DR. W. S. FOX and DR. G. A. SIMMONS, Monday and Friday 10 to 4

Pathological Specimens in the Museum by DR. R. S. TREVO Thursday 2 to 4

LONDON HOSPITAL

General Surgery

MR. FREDERIC EVE — Monday and Friday

MR. J. HUTCHINSON — Wednesday 2

MR. T. H. OPENSHAW — Thursday 2

MR. H. M. RIGBY — Tuesday Friday 9

MR. JAMES SHEPHERD — Tuesday 9 Friday 2

MR. HUGH LEIT — Monday 9 Friday

MR. RUMELL HOWARD — Thursday 9

MR. R. WARREN — Tuesday 2

MR. F. KIND — Tuesday and Thursday 2

MR. R. MILNE — Wednesday 2

MR. A. J. WALTON — Wednesday 9

Gynaecology

DR. DRUMMOND MAXWELL — Monday Thursday 9.30

Ophthalmic Surgery

MR. A. B. ROXBURGH — Thursday 9

MR. W. T. LESTER — Wednesday 3

Acute Surgery

MR. HUMTER TOO — Thursday 2.30

Demonstrations

The X Ray in Treatment and Diagnosis, by DR. GILBERT SCOTT

Cases of Skin Disease of Surgical Interest by DR. J. H. SEQUEIRA

MIDDLESEX HOSPITAL

General Surgery

MR. A. PEARCE GOULD and MR. W. S. HANDLEY — Monday and Thursday 30

MR. JOHN BLAND-SUTTON and MR. GORDON TAYLOR — Wednesday and Saturday 30

MR. JOHN MURRAY and MR. ALFRED JOHNSON — Tuesday and Friday 30

MR. T. H. KELLOCK and MR. GORDON TAYLOR — Tuesday and Friday 1.30

Gynaecology

DR. C. MILES BERKELEY and DR. VICTOR BONNEY — Tuesday and Thursday 30

SURGERY GYNECOLOGY AND OBSTETRICS

Mr. GEORGE WAUGH—Wednesday and Friday

Mr. SIDNEY HODD—Wednesday and Friday 10.
Mr. CHAD WOODWARD—Wednesday and Friday 10.

ST MARK'S HOSPITAL

Surgical Clinics.

Mr. LOCKHART MUMFERY—Monday 2.30.
Mr. VALETT BALDWIN—Wednesday 2.30.
Mr. GORDON WATSON—Thursday 2.30.

Clinical Demonstrations:

Mr. GRAEME ANDERSON—Tuesday 2.30.
Mr. L. E. C. NORRIS—Friday 2.30.

NEW HOSPITAL FOR WOMEN

General Surgery:

Miss ALDRICH BLAKE—Tuesday Friday 9.
Miss CRADDOCK—Monday and Thursday 2.
Miss GARRETT ANDERSON or Miss BOLTON—Wednesday 9.

MEMBERSHIP IN THE CONGRESS

Any physician or surgeon in North America in good standing may become a member of the Clinical Congress by registering at any annual meeting and paying the registration fee. Automatically the subscribers to *SURGERY GYNECOLOGY AND OBSTETRICS*, the official journal of the Congress, will receive invitations without request. Other members of the profession who desire to attend will receive formal invitations upon request to the General Secretary 31 North State Street Chicago.

REGISTRATION FEE

A registration fee is required of each surgeon upon registration, at which time a membership card will be issued.

Unlike conditions prevailing in most medical societies, where annual dues are paid by each member without regard to his attendance at any meeting of the society the payment of a registration fee is required of a member of the Congress, only when he is in attendance at an annual session.

The purpose of this fee is to provide funds to meet the expenses of preparing for and conducting the annual meeting, in order that no financial burden may be imposed upon the members of the profession in the city entertaining the Congress. Judging from past experience, the amount received from such fees will be barely sufficient for the purpose so that payment of the fee is expected of all who register.

MEMBERSHIP CARDS

It will be absolutely necessary for each surgeon who desires to attend the clinics and evening sessions to register at headquarters and secure a membership card. Admission to all clinics and evening sessions will be strictly limited to members of the Congress upon presentation of such membership cards.

RESERVED TICKETS

Reserved tickets for all clinics and demonstrations, properly numbered and couponed, corresponding to the capacity of each operating room, will be issued to members of the Congress in order of application. Provision will be made by which these tickets may be arranged for in advance based, of course on the tentative program. In the contingency of the popularity of certain clinics resulting in an unusual demand for tickets thereto the tickets will be distributed in order of application day after day until all applications have been satisfied.

EVENING MEETINGS

On Monday the evening session will include the brief formal opening of the Congress, followed by important surgical addresses and discussions, the program closing with the Presidential address of Dr. John B. Murphy. The evening programs on Tuesday Wednesday and Friday will be divided with section for general surgery meeting in the Grand Hall of the Cecil, and the Eye Ear Nose and Throat division in the Ball Room of the Savoy. While the programs are not yet complete announcement is made of several of the speakers on page 3 of this section of *SURGERY GYNECOLOGY AND OBSTETRICS*.

SPECIAL RATES

Special reductions of 5 per cent to the members of the Congress and immediate families are announced by the International Mercantile Marine Lines for the trip to England after July 9th and on other lines after July 15th. The same reduction applies for the return trip up to August 15th on the former lines and to August 20th on the latter. This discount will of course not be allowed to apply on bookings to bring them below the minimum rate. Further information can be had from Mr. J. P. McCann, Transportation Manager Marbridge Building New York City.

together with a most wonderful thoroughness establishes the fact that sarcoma occurs only in one per cent of all cases of tumors of the uterus.

For the clinic at Freiburg, our pathologist Professor Aschoff examined microscopically a series of four hundred tumors of the uterus that had been previously removed by me. He found sarcoma present in approximately one per cent of the cases. The apparent danger is minimized by the fact that sarcoma occurs in but one per cent of the cases.

Further it must be borne in mind that it is by no means uncertain that röntgen treatment will not influence sarcoma-cells in exactly the same way as the myoma-cells. As I reported at the previous meeting we treated a series of 350 cases of tumors of the uterus with röntgen rays, and all were successful in stopping the bleeding and the reduction in the size of the tumors, and so far as we are able to ascertain there has been no relapse. In accordance with the previous statistics showing one per cent of sarcoma we should expect in this series three or four cases of sarcoma. Since no tumor grew during treatment or afterwards so far as we could ascertain it must be assumed that the three or four cases of sarcoma to be expected if they actually occurred were cured by the röntgen treatment.

I believe that I have defined the broad limits for the use of röntgen treatment as against the operative treatment. Dr Gauss will speak about the technique of the treatment. I cannot however close this short discussion without first mentioning the fact that röntgen rays and radium while valuable and effective are also dangerous, when used without proper precautions. It requires considerable experience to obtain good results.

As I am speaking to an audience of obstetricians and gynecologists I will, with the permission of the president, spend a few minutes in discussing an obstetrical procedure in which we at the Freiburger Clinic have taken an especial interest. I mean the securing of painless delivery by the use of scopolamine-morphine semimarcosis. This special phase of narcosis we have named "Dämmerschlaf" which translated into Eng-

lish would be twilight sleep. Our clinic has experience covering three thousand births effected under the influence of this drug.

The desire to lighten the pains of parturition is inherent in all civilization that is worthy of the name. With the increasing demands of brainwork naturally goes a keener sensitiveness to all shocks which may accompany pregnancy and therefore, to the shocks given by pains. If we bear to-day that it is just in the very civilized and cultivated circles that so great a number of women undergo difficult and surgically-assisted parturition we know that the cause is not to be sought for in the fact of greater resistance owing to narrow or contracted pelvis nor in the falling activity of labor pains and lack of muscular power. We all know that narrow pelvis is particularly rare in the better classes and also that owing to the prevalence of sport, muscular weakness in the upper classes is very seldom met with. The great number of operative deliveries is to be accounted for by the fact that modern woman has not the strength to resist the nervous exhaustion which is caused by the apperception of pains. We do not deny that by means of narcotic inhalations, chloroform, ether and laughing gas many cases in childbirth can be painlessly delivered. Nevertheless these measures are not quite satisfactory. First, because they make such great demands upon the obstetrician, and, secondly, when persevered in for a considerable time they materially diminish the efficacy of the labor.

In our clinic, my assistant, Dr Gauss has worked out a method with the use of narcotic injections of scopolamine and the observance of quite definite measures, which we have found to answer excellently in a series of about three thousand deliveries. This method rests upon the administration of a semi-narcosis, a state of *Dämmerschlaf*—a state during which the woman concerned has indeed a perception of pain but not an apperception. She still reacts to the labor pains with an expression of pain, but afterwards she has no recollection of the pain experienced.

Scopolamine-morphine is given in small

doses, frequently repeated as a hypodermic injection. The entire technique depends upon the dosage. Two opposite extremes must be avoided if too much is given in order to bring about a full narcosis from which all expression of pain is absent the labor pains cease and there arises the danger of atonic bleeding. On the other hand if too little is administered the pains are perceived and also apperceived. They are remembered and the nervous exhaustion which this narcosis is designed to avoid arises as if no narcosis had been induced. Between these two limits lies the region of twilight sleep. You all know this condition. When you give a few drops of ether at the beginning of each labor pain there arises a condition akin to drunkenness, the patient cries, gives expression to pain but afterwards remembers little or nothing identically the same condition can be brought about by the injection of scopolamine morphine or as we have latterly learned by scopolamine narcophine.

The quantity given must be regulated by a psychological index, namely by frequently repeated tests of the memory for it is a peculiar quality of the alkaloid of scopolamine that affects memory in such an intensive and peculiar way. The tests begin after the first two standard doses which are given after an interval of three-quarters of an hour. The first dose 0.00045 scopolamine combined with 0.03 of narcophine, the second dose 0.00045 of scopolamine alone. Half an hour after the second dose the woman is asked whether she remembers that half an hour previously she was stuck with a needle or that she saw a watch or some other object that was shown to her at that time. If she remembers, the desired effect has not yet been achieved if however she does not remember she has passed into the desired condition of semi-narcosis. The tests are repeated at intervals of a half hour and when the recovery of memory occurs the injections are repeated as needed. Recently we attempted to bring about a standardization of the dosage of this twilight sleep in order to simplify the procedure. We were able to begin this only after we had gathered a very large experience and after Professor Straub had succeeded in

providing scopolamine of uniform and standard strength. In a series of one hundred fifty cases we found that when the dosage and time of scopolamine were regulated in accordance with the schedule posted on the wall in the cases of women of average strength and good health the desired degree of narcosis resulted.

We believe on a basis of our experience with over three thousand cases in which no detrimental results ever occurred for the mother that we are safe in recommending this drug as not dangerous to mothers. It must be admitted in some cases the frequency of pains is slightly reduced but our calculations show that the average duration of birth has been increased by only half an hour. We do not want to omit mentioning the disadvantages of this procedure.

The disadvantages of this method consist in the fact that with some women especially when the surroundings are not very quiet transitory states of confusion of mind and excitement occur. These are of no material importance so long as the relations of the mother do not remain in the room, for these states of excitability make an unpleasant impression on the family. In consequence of this we only carry out the method of 'twilight sleep' in cases where the relations promise to be out of the room during the whole time of the birth.

A further disadvantage of the method is that, owing to the absorption of the thinnest amount of scopolamine and narcophine by the child occasionally an apnoea sets in during the first moments of its life outside the womb and the child only begins to breathe after a certain time by the operation of the carbonic acid gas.

We must assume, as would happen in the case of any other narcotic, a temporary passage of the scopolamine through the child's body during birth, yet Holzbach's experimental investigations have shown that the scopolamine of which only the most infinitesimal traces were present, is completely eliminated from the body in the urine within two hours after birth. It is, therefore justifiable to assume that any action on the child is practically negligible. This is confirmed by the fact that the child mortality at birth has

not increased in the least and indeed if any thing has diminished. If in spite of this we have touched upon the question of the after effects of scopolamine, we have done so with the object of taking into consideration as far as possible every conceivable disadvantage to the child. Hoche, of the Department for Mental Diseases of the University of Freiburg who has an extremely wide experience of the action of scopolamine, has on theoretical grounds repudiated the idea that injurious effects might first make their appearance in the child years later. We did not however content ourselves with these theoretical considerations. The most exhaustive inquiries were made regarding five hundred children one year old who at their birth had been exposed to the action of scopolamine and we succeeded in tracing four hundred and twenty

of them. Eleven per cent had died in their first year. This is a very favorable figure when we consider that the death-rate for children under one year old in Baden is identical. We are certainly justified in concluding from this that children in the year immediately following their birth experience no ill effects from the scopolamine administered to their mothers.

The great number of cases has, I think, provided a proof that the small quantities given by us of scopolamine and morphine or narcophine eliminates all probability of danger for the mother and also as I have just explained for the child. The decreasing capacity for resisting pain shown by cultured civilized women seems to us urgently to call for measures which can reduce the pains of childbirth.

THE TREATMENT OF BLOOD-VESSEL INJURIES

By W. W. GRANT M. D. DENVER

I AM encouraged to present this subject for consideration chiefly because of its seeming neglect, and the absence of any approach to uniformity or the application of scientific surgical principles to the treatment of hemorrhage and its common sequel, shock, by a good many men who are doing surgical work. I wish to acknowledge in the preparation of this paper my indebtedness especially to the recent work of Stevenson, "Wounds in War. The Surgery of the Vascular System" by Burnheim of Johns Hopkins, "Lefors' Wounds and Ruptures of the Great Vessels," and Lexer's "Bevan Surgery."

Not a year passes that every active surgeon does not know of the sacrifice of limb or life by an untimely or unnecessary operation from injury or from hemorrhage from a damaged blood vessel, or shock from secondary hemorrhage from not ligating or suturing the injured vessel. Necessarily the conditions come under the head of urgent surgery which demands ready wit and prompt skillful, yet

deliberate, action on the part of the surgeon. There is no more severe test of his judgment than the action required to arrest dangerous hemorrhage. In the embarrassment and confusion of the environment and attendant circumstances, the doubtful or wrong thing is not infrequently done. In military action, eighty-five per cent of the deaths on the field are due to hemorrhage. The smaller the bullet and the greater its velocity, the cleaner the cut, or wound, of the vessel whether at right angles to the vessel, or tangentially; therefore the greater or more profuse, the hemorrhage. If the vessel wall is grazed or contused the danger of secondary hemorrhage from sloughing is great. If the coats of the vessel are only partially severed, the hemorrhage is more severe and dangerous than if the entire continuity is divided. In the former retraction and contraction are inhibited in the latter the reverse, the elastic intima, especially contracting and receding to a greater extent, a condition favoring the

rapid formation of thrombus. As shock aids the coagulation by lowering the blood pressure and impairing the vascular tonus its first effect is *conservative* in the arrest of primary hemorrhage. Lacerated vessels bleed less than clean-cut wounds. Secondary hemorrhage in a clean wound will not occur if both sides of the wounded vessel are ligated or sutured at the seat of the injury primarily. In the establishment of collateral circulation, there will be recurrence of hemorrhage from the distal end of the injured vessel if it is not ligated or sutured. In the medical records of recent wars the mortality from ligation at the site of injury for secondary hemorrhage is much less than from any form of compression or amputation, varying from forty-three per cent in our own Civil War to twenty five per cent in the Boer War. The Hunterian operation is more unsuccessful and fatal the mortality being thirty-six per cent in secondary hemorrhage. Notwithstanding the axiomatic principle that general anaesthesia and the trauma of operation should not be superadded to the severe shock already existing it is too often for different reasons, not respected or recognized in practice. In civil practice, the procedure should be different from that which may be perfectly justifiable in military surgery. The better environment and equipment of the former imperatively demand more conservative methods, and when necessary or advisable the more elaborate and available technique.

When the caliber of a large artery with or without its companion vein of the extremities is opened by a bullet, or sharp instrument, free immediate hemorrhage results. The sharper and smoother the instrument, the greater the hemorrhage. When not immediately fatal, the patient is in severe if not profound, shock. The first duty of the surgeon is to immobilize the limb and use the ordinary methods of compression to control hemorrhage, temporarily and then to devote his energies to the promotion of reaction by external heat, salt infusion by rectum or venous transfusion and if loss of blood and severity of shock justifies it, direct blood transfusion as perfected by Crile and the use

of such heart stimulants as one's experience may justify but it must not be forgotten that the most urgent and necessary heart stimulant is a fair volume of blood in the arteries. The heart beats will not be quickened nor strengthened unless the vessels are adequately filled with serum or normal blood.

When reaction is established, the second consideration is to prevent an immediate recurrence of the hemorrhage also the danger of secondary hemorrhage at a later date usually from the fifth to the tenth day. Any method of treatment which does not involve or include as a necessary requisite operation on the damaged vessel itself suture or ligation at the seat of injury will be dangerous and frequently fatal to the integrity of life or limb. In a ragged wound, the thrombus is more rapidly formed at the site of the injured vessel. It becomes partially organized and temporarily plugs the vessel. As the volume of blood is restored, the thrombus cannot be relied upon to resist the *vis a tergo* or increased heart beats, until well organized. As a result, a clot is generally dislodged and, in some cases conclusively indicated by a little fresh arterial blood from the wound within a week which is a forerunner of more severe hemorrhage to follow. At this stage the embarrassments and difficulties are greater than in the primary hemorrhage, and for its treatment, requires prompt, acute surgical judgment as well as skillful surgical technique.

Carrel has demonstrated that a circular end to-end suture of an artery is not followed by either secondary hemorrhage or aneurism. Its success in the human subject has been repeatedly demonstrated. The first arterial suture was by Hallowell in 1759. Horach was the first to try an end to-end suture in 1888. Abbe succeeded in using a glass bobbin in 1894 which was afterwards elaborated by Murphy with the first circular suture in 1897 and Carrel's teacher — Jaboulay and Briau while the first arteriovenous anastomosis was by Hubbard in 1906 for gangrene of the leg. "If the artery is essential to the life of the part which it supplies it should be closed by end or lateral suture depending

upon the character of the injury. If not essential it may be ligated above and below the point of injury. If the diagnosis of injury to an artery is made with or without simultaneous injury of a vein the point of injury should be exposed even if there is no external hemorrhage blood-clots removed and the vessel ligated or sutured.

Besides the local and general condition the application of a stethoscope to the seat of injury will aid in the diagnosis by revealing a blowing sound or bruit.

Gangrene of leg follows 50 per cent of cases of ligation of the popliteal artery 20 per cent of the femoral 50 per cent of both femoral artery and vein 1 to 2 per cent of the femoral vein alone. "It must be accepted as a maxim that the preservation of the blood and nerve supply rather than the condition of the bone and soft tissues is the most important consideration in the preservation of the limb. Primary amputation is indicated only when the principal vessels and nerves are involved with extensive destruction of bone and soft parts.

The occlusion of the axillary the brachial the femoral and popliteal may not be considered fatal to the nutrition and preservation of the limb distal to the injured part but the integrity of these vessels is so necessary and important that the condition should be treated as if they were absolutely essential to the preservation of the limb. The first consideration after reaction should be in case of injury to such vessels, to explore the wound guided by the track of the bullet or implement to the seat of injury and the vessel treated in accordance with the equipment and technique fully described by Carrel or Burnheim. This is the ideal treatment but in the absence of the necessary equipment and conditions for its performance the next step which should be imperative is ligation of the vessel both above and below the point of injury. If the former is done the blood supply is restored to the limb and gangrene

will not result, especially in the absence of infection. If ligation is employed, which is the classical method in military surgery and heretofore in civil practice the preservation of the limb depends upon the establishment of the collateral circulation, and the success of this depends partly on the location of the injury as well as upon the immediate attendant conditions, general as well as local. In the majority of cases the result will be favorable. If infection and gangrene occur in these injuries the limb distal to the injury will probably be lost. If partial or localized gangrene only occurs, it is still possible to save the limb by suture of the vessels or reversal of the circulation. If neither suture of the vessel nor ligation is employed secondary hemorrhage becomes a menace of such momentous importance and danger as to threaten the rest and conscience of the surgeon for it will come with the suddenness and force of an explosion. Infection increases the probability and danger of secondary hemorrhage. In the absence of infection especially the patient should have the benefit of the same conservative treatment as in the primary. If infection exists in the absence of gangrene ligation is probably the operation of choice but if the primary injury and hemorrhage are treated in accordance with the principles and technique of modern surgery secondary hemorrhage will be rare consequently will not so frequently as now demand the consideration of the surgeon. If both artery and vein are injured, the difficulties and dangers are greater just as it is when both are involved in aneurism.

In thrombus with partial or threatened gangrene, reversal of the circulation is promising of better results, and the lateral arterio-venous anastomosis of Burnheim seems to possess advantages over the end-to-end anastomosis of Carrel.

In this paper it is not my purpose to more than allude to the concealed, or intra-abdominal hemorrhage from bullet or stab wounds, nor from the impact of heavy or falling bodies on the abdomen. In these injuries there is not only frequent and dangerous hemorrhage but the added danger of extrusion of the fecal contents. Such

Lewis, p. 137

Lewis, p. 133

Lewis, p. 136

Chambers and Merritt, *Strenuous*, article on War

There good histological chapter. Some special

Injuries are almost uniformly mortal within forty-eight hours, in the absence of prompt operation nor in view of the location of the injury. It is safe to defer an exploratory operation long in the presence of persistent shock for the latter indicates continuous hemorrhage or extravasation or both. But it is to be remembered that when profound anesthesia and the trauma of operation are added to the existing shock we have made a favorable result not only much more difficult, but often impossible. Under the conditions of such injuries it is better and wiser as a rule not to employ general anesthesia at all, though full consideration should be given to nitrous oxide and oxygen in preference to others.

Local anesthesia may be used to advantage in many such cases, and it should appeal to the surgical judgment in the shock and prostration from primary or secondary hemorrhage.

It sounds the recall of a fundamental principle to protest against its frequent violation in shock and first aid to the injured and to protest the needless sacrifice the greater because of the silence of so many teachers and leaders of opinion.

Shock is exhaustion of the nerve-centers (Crile.)

Shock is inhibition of the activities of the nerve centers. (Meltzer.)

Shock is loss of vasomotor control due to hemorrhage and to afferent peripheral impulses such as trauma to the visceral peritoneum. (Janeway.)

Shock is due to a reduction of the diastolic blood-content, and to impaired vascular tonus. (Henderson.)

Regardless of the cause and the definition it is always a serious condition and a problem of important significance to the surgeon.

CONCLUSIONS

We reaffirm the conclusion that general anesthesia and operation in grave shock from injury and hemorrhage is indefensible that the first effect of shock from hemorrhage is conservative in promoting the rapid formation of thrombus and arresting bleeding probably from impaired nerve and vascular tonus in reducing blood pressure and depressing the action of the heart that reaction should be awaited and the interval used in promoting it by well-known methods.

If reaction should *not* occur in a reasonable time, depending on, or influenced by the nature of the accident and the previous state of the patient, ether and the trauma of operation would only aggravate the condition and render recovery still more doubtful. If with reaction, the damaged vessel is not operated on, it will be wise not to stimulate the heart prematurely but rather keep it mildly subdued in order to give sufficient time for the thorough organization of the thrombus, as, without suture or ligation, it is the chief obstacle to secondary hemorrhage. When reaction is assured the damaged vessel—such as axillary or brachial, the popliteal or the femoral—should under local or general anesthesia, be preferably sutured, secondly ligated without needless delay. With successful suturing of the vessels, nutrition of the parts is preserved and gangrene prevented. With ligation the collateral circulation will, in a large proportion of cases, preserve the nutrition and integrity of the parts but it is more uncertain than suture but more reliable than other measures.

Amputation has no place in modern civil practice as a remedy for traumatic hemorrhage and a smaller place in the military surgery of the future among civilized nations than in wars even of the recent past.

SURGICAL REPAIR OF BLOOD-VESSELS ITS TECHNIQUE, ITS USES AND LIMITATIONS¹

B. J. SHELTON DORSEY M. D. RICHMOND, VIRGINIA

SUTURING blood vessels was first put on a satisfactory basis by Carrel, who established the principle that successful suturing depends upon the approximation of intima to intima with a minimum amount of injury. The chief difficulty to overcome is occlusion by clotting, and improvements in technique are intended to prevent an excessive amount of clotting. The physiology of thrombus formation is still rather vague as it is impossible to isolate chemically some of the substances that are involved in this process, and their presence has to be taken for granted in order to support a reasonable hypothesis. There are certain general reactions however that all physiologists agree to. The direct formation of a thrombus is due to the action of fibrin ferment on fibrinogen. Fibrinogen exists normally in blood plasma. Fibrin ferment is built up from various substances and is probably formed from the action of a thrombo-plastic substance called by some thrombokinase upon thrombogen in the presence of a solution of calcium salts. Thrombokinase is not a true kinase in the sense of acting solely as a ferment, for it is used up in the process of clotting. Thrombokinase is the key to the situation and whether it acts directly or indirectly as Howell claims by combining with antithrombin in the blood and thus liberating prothrombin (thrombogen) it nevertheless is essential to clotting and to a large extent regulates the quantity of thrombi formed. Thrombokinase is supposed to be present in all tissues of the body, and also comes from disorganized blood-corpuscles particularly the platelets. It seems abundant in the ad intima of blood vessels.

The practical bearing of these facts upon blood vessel surgery is very evident, for thrombokinase can only be liberated from injured tissue. As the amount of clotting is directly proportionate to the amount of

thrombokinase, it is readily seen that any undue injury to blood vessels by rough handling or by drying of the endothelial cells of the intima, or by the presence of too much foreign substance in the lumen, or by chemical or bacterial injuries, will result in the liberation of so much thrombokinase that there is excessive thrombus formation and the vessel is occluded. Even the most successful suturing of blood vessels is accompanied by some clotting but a limited amount is essential as it serves to fill the punctures from the needle holes and to bridge over the line of contact. In successful vessel suturing, however the injury is so slight that very little thrombokinase is released and consequently there is only a small amount of thrombus formation just enough to plug the punctures made by the needle and not enough to occlude the lumen.

We recognize, then as the principles for successful blood vessel surgery that a continuous surface of vascular endothelium must line the lumen and that as little injury as possible must be done this endothelium. The importance of presenting to the lumen of the vessel a continuous surface of vascular endothelium is appreciated when we recall what has been learned in a somewhat coarser fashion by intestinal suturing. Here it is a well recognized principle as it is in blood vessel suturing, that the endothelial surfaces must be approximated accurately. In the case of the bowel the endothelium is on the *outside* and it is necessary to turn *in* a small flange or *shelf* to secure accurate apposition of the peritoneal endothelium. In blood vessel the endothelium is on the *inside* and it is essential to turn *out* a flange in order to approximate the endothelial lining of the blood vessel. The usual method of suturing blood vessels consists in first placing three guy sutures and then whipping the edges of the vessel together by an overhand stitch. This necessarily cannot approximate the

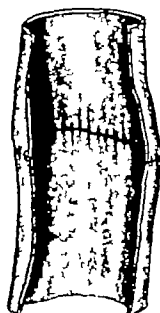


Fig. 1



Fig. 2

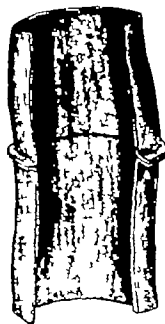


Fig. 3

Fig. 1. This drawing reproduced from Guthrie shows the appearance of the lumen of blood vessel immediately after it is sutured by the method of Carrel. Note the large amount of blood exposed in the lumen.

Fig. 2. This drawing also from Guthrie shows the appearance of the lumen of blood vessel several weeks after an end-to-end suture. The suture line has been covered by endothelium, which is still partly transparent. The suture line is thicker and more opaque because the suture is covered by the suture until after several months the suture is completely hidden from view. This is not a method of suturing, neither the mattress or

overhand stitch is used. It is the first day or two after the suturing before the stitches are covered over so that the amount of thread in the lumen is important. Sutures seem to work away from endothelial surfaces toward the lumen in case of the intestine and toward the surface in the case of blood vessel.

Fig. 3. This drawing shows the eversion of the intima covered by the double mattress suture and the consequent absence of any raw surface left in the lumen of the vessel. Note the very small amount of thread left exposed to the blood current compared with Fig. 1. Note also the strong grip that the loop of the mattress suture has on the tissue

endothelial surface on the inside as accurately as would a mattress suture which turns out a flange and compels the apposition of the intima. No one would think of suturing a bowel in a similar manner and claim that the peritoneum would be a curately brought together by merely whipping over the margin of the bowel wound as in suturing skin. If this cannot be done in intestinal surgery the same thing holds equally in blood vessel surgery.

The presence of foreign substances in the lumen of blood vessel promotes clotting. Some substances favor clotting more than others. A coating ofaseline or paraffin retard clotting. Other thing being equal however the larger the amount of foreign

substance or raw surface in the blood vessel the greater the likelihood of extensive clotting. A mattress suture which turns out a flange not only approximates the intima more accurately but leaves almost no thread exposed in the lumen whereas the regular overhand suture leaves a considerable amount of thread in the lumen. This is readily seen from the accompanying cut (Fig. 1) which is reproduced from Guthrie's work on blood vessel surgery and shows the inside of the vessel soon after being sutured by the usual method. The mattress suture which is parallel to the wound also secures a better hold upon the tissues than the overhand suture which is at right angles to the wound and the mattress suture is consequently less liable to cut

(Fig. 3) This is due to the fact that in the mattress suture the tension is more equally distributed along the whole loop of the stitch whereas in the overhand stitch the tension is concentrated at one point—that is, at the end of the suture farthest from the wound. This fact has been brought out by Lexer in the following case:

Lexer of Jena showed a case of ileal operation for aneurism and transplantation of the vessels. The patient was operated on according to the rules established by Lexer in 1907. To maintain the circulation in its normal channel the spindle-shaped aneurism beginning above Poupert's ligament and extending below the vena profunda was removed and the defect of the vessel repaired by the introduction of a piece of the saphenous vein 8 m. long. The wall of the artery markedly changed by arteriosclerosis allowed the thread of the running suture of Carnot to cut through. On the other hand the continuous protruding mattress suture gave very good results. The thread not only held well but also prevented hemorrhage.

Asepsis in blood vessel suturing should be as nearly perfect as possible just as it should be in abdominal surgery, brain surgery or bone surgery. If the tissues around the blood vessels are infected no suturing can be expected to be satisfactory. Yet even in the presence of infection it is not invariably a failure as I have once successfully sutured femoral artery in a dog in which the tissues around the vessel suppurated for several weeks. As a rule however infection will result in failure and the proper aseptic technique should be insisted upon. Particularly should dust infection be avoided. The operator should wear a mask over his mouth and the floor of the operating room should preferably be moist. In laboratory work the floor should be flushed with water an hour or two before operating. The manner of handling tissues is most important for gentleness is an absolute essential. No matter how careful the aseptic technique, good results cannot be secured by one who uses the same methods of handling tissue in blood vessel surgery as would be adopted in bone surgery. The vascular endothelium should not be permitted to dry and should not be touched with any instrument.

As for instruments, I use No. 6 straight

needles threaded with 00000 twisted black silk. They are threaded with silk about 14 inches long and a single knot is tied on the eye of the needle to prevent it becoming unthreaded. The short end should be cut within half an inch of the needle to avoid unnecessary loose ends dangling about. Five of these threaded needles are run through a piece of gauze of double thickness about two inches wide and as long as the thread. This gauze is then placed in a small can or ointment jar that is one third full of white vaseline. More vaseline is put over the gauze and the jar is fastened and sterilized. The needles are not removed until they are to be used when they are taken from the gauze and the gauze which is thoroughly impregnated with vaseline is laid beneath the artery to protect it from the surrounding tissue. If necessary to have the arterial suture tuff which has been fully described in other publications it consists of two small shafts of steel united by a spring so that the short shaft forms an angle of about 60 degrees to the long shaft. There are two buttons on the end of the short shaft, two about opposite to these on the long shaft and one near the spring on the long shaft (Fig. 4). In order to occlude the vessel either a rubber covered Crile clamp is used or the ordinary serrine or bull dog clamp, uncovered which has a spring so weakened that the clamp can grasp the skin of the forearm without pain. The inside of the vessel should never be seized with forceps though sometimes it is necessary to grasp the outside. For this purpose the ordinary thumb forceps, alligator forceps, by the instrument dealers and used for biological dissection are excellent. Several mosquito hemostatic forceps are often needed. Aside from these special instruments the usual instrument may be employed. The knife and scissors should be sharp.

The vessel is exposed keeping the tissue as dry as possible. A suture is placed on the portion of the vessel nearest the heart and the vessel is then gently grasped between the thumb and finger and tripped of blood to the other angle of the wound where another serrine is placed. This leaves the artery dry and flat like ribbon. The as-

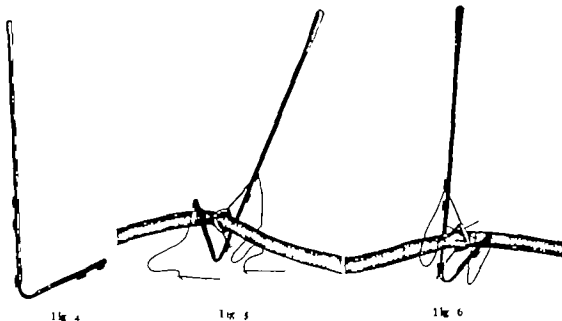


Fig. 4

Fig. 5

Fig. 6

Fig. 4. The arterial suture staff. For description see text.
Fig. 5. The three guy sutures have been placed and fastened to the bottoms on the staff. The threaded ends from the last three sutures are left long for further suturing. The circumference of the vessel is made triangular and the intima is everted by the tension of the spring of the suture staff.

Fig. 6. The handle of the staff is upright and the hole instrument is lifted up somewhat to increase the eversion of the intima. The continuous double mattress, or cobbler, stitch has been started using the threaded ends from the last three sutures. The needles are thrust through the margins of the artery near the insertion of the second guy suture. The needles should be inserted at about right angles to each other so they can be handled better. The suturing in this third is done toward the operator that is, from the second to the third guy suture.

linized gauze from which the needles have been removed is now placed beneath the vessel, after stopping all bleeding in the wound and the artery divided with one stroke of sharp scissors. The fingers are wiped free of blood and moisture on a dry towel and the left finger and thumb grasp one of the ends of the artery rather firmly and pull the adventitia over it cut end. The adventitia is cut off on a level with the rest of the artery. It then retracts, leaving the middle and inner coats exposed. Any remaining clots in the vessel are stripped out with the thumb and finger and the end is held firmly between the thumb and finger of the left hand and sponged with dry gauze. As the artery is collapsed and its end held between the finger and thumb the gauze cannot touch the intima but merely wipes the wounded portion and so removes any excess of thrombokinase. The tip of a finger of the right hand is then

dipped in white vaseline and the end of the artery is smeared over with vaseline immediately after being sponged. This serves to keep back any further juices from the severed artery and also prevents drying of the intima. The other end of the vessel is treated in the same manner. All of these manipulations are done rapidly for it is essential to complete the suturing as quickly as possible after the intima has been exposed. One of the sutures which has been prepared as directed is inserted from without inward at one end of the artery and from within outward at the other end. No more of the vessel wall should be grasped than is necessary to secure a fairly good hold. An artery is quite tough and a small bite will be sufficient. If too much is taken the intima cannot be properly everted. The first loop of a knot is tied bringing the ends of the vessel together. The second loop of the knot

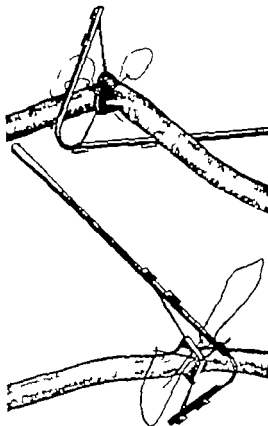


Fig. 7 The handle of the staff is depressed until it is horizontal and points away from the operator. The hole in the instrument is moved toward the operator so as to increase the eversion of the intima in the second third. The suturing is continued as "cobble" stitch.

Fig. 8 The handle of the staff is then brought over horizontal position pointing toward the operator. The instrument is lifted up so as to increase the eversion of the last third. The suturing is continued toward the second guy suture.

is tied while holding the ends of the suture taut running the knot down in this manner so as to prevent the first loop from slipping. After tying this suture the arterial suture staff is placed under the artery with the short shaft pointing toward the operator. The guy suture is fastened by wrapping it two or three times around the lowest button on the long shaft. The length of the suture from the button to the vessel should be about half an inch. The second suture is placed about one third of the way around the circumference of the vessel and should be on

the side away from the operator. The suture staff can be laid flat so that the short shaft is not in the way and the vessel ends can rest upon the long shaft, thus making it easier to insert the second suture. The second suture is inserted and tied in a manner similar to the first and is wrapped around one of the upper buttons on the long shaft. The threaded end is left long for future suturing, but the other end is cut close to the button. As two guy sutures are now fixed to the long shaft the third one is easily inserted by raising up the long shaft when the point of insertion of the third suture is indicated by the retraction of the margins of the artery. The needle is inserted at the apex of the retracted margin. After this suture is tied the short shaft is slightly compressed toward the long shaft and this guy suture is wrapped around one of the buttons on the end of the short shaft. The threaded end is left long and the unthreaded end is cut close as in the second suture. It is important to have no unnecessary ends hanging loose. The short shaft is released and the spring makes tension on the margins of the artery, converting its circumference into a triangle, and everting the intima (Fig. 5).

The three guy sutures are inserted in the same way when an artery is united to a vein of much larger caliber as when a divided artery is united. Sometimes it is a little more difficult when a small artery is united to a large vein, but after the guy sutures are once inserted, the rest of the procedure is identical whether vessels of equal or unequal caliber are to be united. We now have two needles from the guy sutures last inserted. A needle is taken in each hand and thrust through both margins of the artery in the region where the second suture was tied. The threaded needle from the third guy suture at the end of the short shaft will of course carry a little loop of thread which is of no consequence. The instrument is lifted up so as to elevate the upper third of the wound and increase the eversion. The suture is then applied in the manner of the double mattress or cobble's stitch, going from the second guy suture to the third (Fig. 6). At the angles particular care should be taken to go

beneath the insertion of the guy sutures otherwise the tension of the guy sutures may produce a wound in the endothelium which would be exposed to the lumen of the vessel. After the first third has been sutured the handle of the instrument is depressed away from the operator and the instrument *shoved toward the operator* so as to increase the eversion of this third of the margin of the vessel (Fig 7). The suturing is continued as a cobbler's stitch. When the second third is finished the instrument is brought to its original position and each needle carried under the vessel so as to be ready for suturing the last third. The handle is then depressed *toward the operator* and held in such a manner as to lift up the last third and so increase its eversion (Fig 8). The suturing is continued through the last third and when this is finished the instrument is again brought back to its original position and the suturing carried about two stitches beyond the point of commencement where the threads are tied to each other. Each stitch must be drawn snugly when it is placed else the intima will not be securely approximated and there will be leakage. In the carotid of a medium sized dog about five stitches are put in each third of the artery.

Sometimes particularly in old dogs, retraction of the ends of the artery is marked and the sutures cannot be properly placed as they will tend to cut out or break under the tension. If the adventitia of the vessel is grasped with curved mosquito forceps about one and one-half inches from the severed ends, the two ends of the vessel can be shoved together by an assistant with out tension on the sutures and without his hand being in the way of the operator. This is better than trying to approximate the ends by the verrene clamps which may either come off or loosen and flood the vessel with blood. After the suturing has been completed the short shaft is slightly compressed toward the main shaft so as to relax the tension on the guy sutures and the distal clamp on the vessel is slowly released (Fig 9). If there is marked spurting at any point an extra suture should be placed there. With a little experience spurting rarely oc-

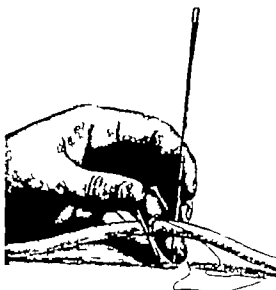


Fig 9. The handle of the instrument is brought to its original position and the threads tied. The distal wireline is slightly relaxed while the short shaft is pressed toward the long shaft so relaxing the tension of the spring. If any markedly spurting point is seen, an extra suture can be inserted.

curs though there is usually oozing of a few drops of blood. The guy sutures are then cut and the instrument is removed. The sutured vessel is very gently compressed with dry gauze and the distal clamp is entirely removed. After about a minute the proximal clamp is slowly removed. In this time the needle holes should be plugged with fibrin and there should be no leakage. The vessel must not be returned to its bed until leakage has ceased. The whole procedure of suturing the vessel, from the insertion of the guy sutures to the last stitch, can easily be done in from ten to fifteen minutes and often in less time. Any competent surgeon who tries this technique experimentally a few times can master it.

This technique has been mentioned in three previous articles. The arterial suture staff has not been altered and the general principle of approximating the intima has always been adhered to. However a great many details of applying this principle have been changed and I think these changes add to the

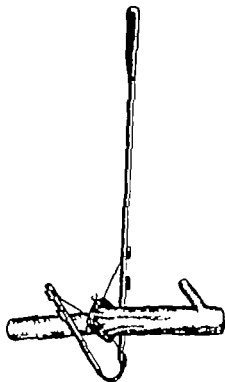


Fig. 1. Showing the method of suture applied to the end of the rubber tube. On the right is the rubber tube which is somewhat larger than the artery. The end has a brush through which a smooth probe covered with vaseline can be inserted and carried up into the artery if obstruction occurs. By pressing on the main trunk of the rubber tube are blown out through the branch.

efficiency of the technique. The suture staff which holds the vessels so that the edges are everted and each stitch is inserted under the same tension from the first to the last, greatly facilitates the suturing and makes possible the carrying out of the principles that have already been noted.

The changes from the other publications are as follows:

1. A double mattress or cobbler's stitch is now used instead of the single mattress stitch as originally advised. It was found that when the single mattress stitch was used there were points between sutures with but little compression and no raw surface. This sometimes made a small amount of leakage that was difficult to control, also a little diathermy would be formed that was

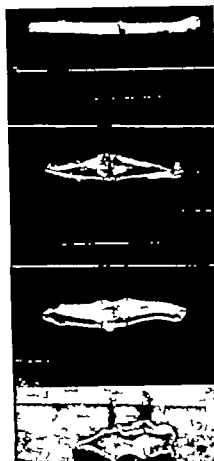


Fig. 2. Showing piece of rubber tube sutured in between the cut ends of an artery. Note the complete absence of any sharp margin of the tube and the absence of thread in the lumen. This cannot be done by the regular overhead suture.

a weak spot and would occasionally result in secondary hemorrhage. The double mattress stitch does away with these objections and approximates the intima firmly as by a fine clamp around the entire margins of the vessel and at the same time exposes no more thread in the lumen than is exposed by the single mattress stitch. The use of this stitch can be readily acquired by any one who tries it. It has been most successfully used in intestinal suturing by Crile and is much more needed in vessel suturing as there is more pressure in a blood vessel than in the bowel.

2. No salt solution is now used to wash out the vessels. It has been the object of this technique to eliminate as far as possible every procedure that is not essential to success. Washing out the ends of the vessel with salt solution not only adds somewhat to the trauma of the endothelium, makes a sloppy wound, and prolongs the procedure but according to Guthrie rather tends to increase clotting than diminish it.

3. In order to strengthen the second and third guy sutures both ends of these sutures are now wrapped around the buttons, instead of merely using the unthreaded ends as was formerly advised. Instead of first inserting the guy sutures and then placing them on the suture staff it is better to fix them on the staff as they are inserted. This not only relieves the necessity of handling the sutures twice when once will do but it is much easier to place the second and third sutures when the first has been fastened to the staff as the



Fig

Fig 3

Fig 14

Fig 5

Fig. Photograph of an aorta artery of dog, which was removed few minutes after suturing, after the blood had been turned on and no leakage appeared. Note the evenness of the intima constituting flange about diminution of the caliber.

Fig. 3. Photograph of the lumen of aorta artery of medium sized dog. The blood had been allowed to flow for few minutes and there is no leakage. Note the absence of thread in the lumen.

Fig. 14. Photograph of aorta artery, 24 days after being sutured. The lumen is smooth. The sutures

have stretched and are visible beneath the transparent coating of endothelium.

Fig. 5. Photograph of femoral artery 35 days after operation. The sutures are barely visible. A small black speck in the upper edge shows the line of sutures. The covering over the sutures is thicker than it usually is in this time, but the specimen illustrates, as compared with previous figure, how sutures are gradually buried.

Fig. 6. Photograph showing external appearance of section of external jugular vein, which was sutured in between the dilated ends of carotid. The specimen was removed 24 hours after operation. It is collapsed and free from clots.

Fig. 7. Photograph of segment of external jugular vein, which was sutured in the place of resected portion of the right carotid of large dog. Note the valves about the middle of the specimen in one of which is small clot. The specimen was dilated at this point probably from the force of the blood stream in overcoming the valves. Otherwise the intima is perfectly smooth and the sutures are mostly buried from view. The specimen was removed 63 days after operation.

Fig. 8. Photograph of specimen of reversal of circulation in the neck. The proximal end of the carotid was sutured to the distal end of the external jugular vein in medium sized dog. This specimen was removed after 30 days. The sutures are distinctly buried though the endothelium over them is still transparent at places. The line of suturing is perfectly smooth. A short distance from the line of sutures the crumpled up valves, which are forced and broken down by the blood stream.

staff can then be manipulated so as to bring the margins of the vessel wound into a more advantageous position for suturing.

Sensational newspaper articles have done blood vessel surgery much harm. The idea that a new limb can be grafted on and will remain useful or that a kidney or thyroid can be beneficially transplanted from one individual to another is entirely erroneous. None of these experiments even in animals has been permanently successful. A kidney transplanted from one dog to another will probably functionate for a while but sooner or later the fine differences of serum and tissue destroy the organ and prevent permanent



Fig. 6

Fig

Fig. 8

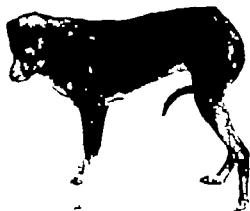


Fig. 9. Photograph of dog in which portion of the abdominal aorta was resected and sections of rubber tubing coated with paraffin and sutured in to fill the defect. The dog made perfect recovery. The photograph was taken six months after operation. The dog was killed and the specimen which was removed showed the tube to be completely encapsulated but occluded. The occlusion had evidently been gradual, as there were no bad symptoms and no paralysis of the legs. A gradual occlusion in such cases which is permissive of time for collateral circulation is usually as satisfactory as if the tube remained permanently open.

success. To quote from the preface to Guthrie monograph on blood vessel surgery: "Heterografts succeed at first, but inevitably fail after the first few weeks. This is the disappointing but unanimous conclusion of the experimenters. Thus there is at present no temptation for the enthusiastic surgeon to try and graft one lobe of the thyroid or a kidney taken from a healthy donor. The poor man will not be tempted to exchange one of his sound kidneys for so much hard cash."

However blood vessel surgery has a very broad field for while complicated glandular organs do not survive transplantation, simpler tissue does. A blood vessel for instance can be transplanted from one animal to another and may functionate indefinitely. The four fruitful fields of blood vessel surgery at present are:

1. Wounded blood vessels. Here direct suture can be used or if much of the vessel has been injured a segment of some vein from the patient's own body, as the saphenous, can be sutured in the defect.

2. In excision of malignant tumors which have been heretofore considered inoperable because of involvement of a large blood vessel a section of the vessel can be removed and the vessel repaired as for trauma.

3. Aneurysm may possibly be treated in a similar way though on account of the diseased condition of the vessel wall it is not likely to be so satisfactory as in surgery following trauma. However several successful cases have been reported as the case of Lever referred to above.

4. Transfusion of blood. There are a great many ways of performing transfusion of blood but probably no method can be quite so ideal as that which permit the flow of the oxygenated arterial blood of the donor directly over an endothelial surface into the veins of the patient. While numerous instruments have been devised for drawing blood from the donor into a receptacle and then injecting it even in the short space of time when the blood is not in contact with endothelial surfaces there may be some changes that will render it less valuable. Certainly it is better to have it directly transferred to the venous system of the patient. The various tubes and canulas are often of great service but if they do not work, the whole operation will have to be done over again.

In the method of suturing just described, when applied to transfusion a vein should be selected sufficiently large and with a nearby branch (Fig. 9). If for any reason an obstruction occur at the suture line the finger can be placed on the main trunk of the vein and the sutured area gently manipulated between the thumb and finger when the clot will usually be blown out of the venous branch. If this is not successful and especially if the radial artery from which the blood is taken contracts too greatly a smooth probe covered with vaseline can be introduced through the venous branch, and carried up through the sutured region into the radial artery. When the probe is withdrawn full flow of blood follows. It is impossible to do this if a canula has been used. After a probe has been once introduced in this manner clotting occurs in from five to ten minutes.

but a free flow of blood for twenty minutes is all that is necessary in most cases and it is better to do this simple procedure two or three times than to perform the whole operation over again. If for any reason the suturing does have to be done again, a small section including the sutures can be removed and will leave enough of the artery and vein to bring together again whereas, with a canula so much of the artery and vein is tied off that enough will hardly be left for another operation.

The photographs of specimens show some

of the work that has been done by this method. A rubber tube has also been sutured in after resection of an artery (Fig. 11). These experiments have not yet been completed and a report will be made later upon this feature. However I do not believe a rubber tube can be sutured satisfactorily into the defect caused by resection of an artery by the overhand method as the tube will leave sharp edges of the rubber exposed to the blood-current whereas the mattress stitch prevents this by everting the edges of both the tube and the artery.

CANCER OF THE BREAST IN A BOY FIFTEEN YEARS OLD

By ROBERT C. BRYAN, M. D., RICHMOND, VIRGINIA

OVER 90 per cent of all tumors of the breast occur in the female and two per cent of this number are malignant. Poirier, Schuchardt and Warfield have collected from literature something like 500 cases of carcinoma in the male mammary gland. The age for this condition is apparently a little later in the male than in the female about 60 years. Trauma is responsible in 13 per cent of female mammary carcinoma and in 50 per cent of the male. Theoretically the right should be involved more often. Both the right and the left breasts however are apparently affected with the same degree of frequency despite occupation as instanced in shoemakers, engineers, etc.

It will be seen from this table that the average age at which the disease originates in males is two years later than in females.

It is further noticeable that a relatively large number of the male cases begin after 70 years of age. In most other respects there is remarkable similarity as to the age distribution in the two sexes.

The two greatest extremes in age of cancer of the breast that the writer can find in literature are the following:

Lunn Case. A man aged 9 years, boemake, admitted into Marylebone Infirmary May 1896. Pain in left breast ten months before admission, due possibly to friction of braces. Small scab formed around the nipple. Three months before admission lump in the left axilla. Fungating growth involving nipple and one inch of areola. Breast and glands removed. Wound healed by first intention. Death from hypostatic congestion of the lungs a few days after operation. At post mortem all cleared. There were also secondary glandular deposits rare in cases of duct carcinoma.

Blodgett reports that his attention was called to boy 15 years of age who was born of healthy parent and in whom no suspicion of malignant heredity could be found. Up to the age of 12 years this boy presented no indication of glandular or other disease. Soon after this time swelling was

Williams, W. R. Cancer of the male breast based on the records of 100 cases with remarks. Lancet, Lond. 1914, 1914.

Lunn, J. Cases of cancer of the breast in men aged 9 to 127. British Med. Jour., Lond. 1907, 1907, 1907.

Blodgett, A. M. Boston M. & J. 90, 1900, 6.

Read before the Southern Surgical and Gynecological Association, Atlanta, December 6, 1914.

	Males	Females
Total number	90	500
20 to 25 years		6
25 to 30 years		4
30 to 35 years	9	6
35 to 40 years		4
40 to 45 years		6
45 to 50 years		20
50 to 55 years	5	5
55 to 60 years		
60 to 65 years		9
65 to 70 years	1	3
Over 70 years		
Mean age	50	48
Earliest age	20	
Latest age	84	84



notched in the left breast beneath and attached to the nipple, which is slightly reddened and harder than the flow of the opposite side. The growth on microscopic examination presented the typical structure of carcinoma, and had invaded all visible glandular tissue of the breast. The wound healed by first intention and there has been no indication of recurrence or metastasis since the operation was performed six years ago.

The case which the writer wishes to present is that of A. C. age 41 years, 8 months operated on February 6, 1913. I August six months before operation the boy while playing golf was struck

violent blow on the right breast about the nipple by golf ball. Slight laceration left his impression made him quit soon for several days. He soon got over the soreness paid no further attention to it but five months later I saw while bathing noticed little lump under and very near to the right nipple. It was not painful, but reflecting the blow he recalled his family decided to have the tumor excised. On examination the boy

was found to be an excellent developed specimen, 5 feet 10 inches, weighing 6 pounds, erect in figure and enjoying the best of health. The family history is negative throughout heart and lungs negative. Urinalysis negative, and the blood count of no peculiarities. A small round hard tumor about the size of the smallest berry stone found in the lower right quadrant about one-eighth of an inch from the nipple freely movable over the skin and on the underlying tissue.

The nipple was the same on the left side there was no retraction nor lumping. The skin over the tumor showed nothing unusual and the most careful investigation of the glandular tissue did not show the clavicle and the inguinal region gave no evidence of their enlargement. In the following week the growth had been handled and palpated considerably and consequently was quite tender.

Under general anesthesia a skin incision was made under the breast the flap dissected back the tumor and surrounding tissue were removed along with the pectoral muscle and the wound brought together. About drainage the patient was sent to hospital three days. A report by Dr. S. B.

Moore, pathologist at Gracie Hospital, states that the specimen, which is denofibroma with distinct acirrhous carcinoma is scattered are of rather active cell proliferation.

The anatomical and pathological differences between the male and female breast are in degree rather than in kind.

Both develop normally until the beginning of the second decade when the female breast begins to take on its complex function and duties, the male to be arrested in growth.

Occasionally there are embryological disjunctions of subepidermal nodules which may extend into the region of the male breast, histologically impossible to differentiate from carcinoma, yet they are not cancer. The bean-like umbilicoid nodules found now and then in the appendix belong to this group. They are unquestionably of congenital origin. Aschoff calls them umbilicoid navi. In the report of Mayo's clinic by McCart, these nodules are called carcinoma of the appendix and have been observed extending to McCart from a boy of nine to a man of eighty years of age.

The diagnosis must be made along identically the same lines as in the female. The same morbid rules obtain. It would appear that tumors of the male breast should be recognized earlier than in the female. Small growths are more easily noticed as they are not surrounded by so much breast tissue. In the later stages pain, retraction, ulceration and metastasis conform to the anatomic principles of the female. The prognosis and mortality then should be better for carcinoma of the male breast than in the female.

EVENTRATION OF THE DIAPHRAGM

WITH THE REPORT OF A TYPICAL CASE WITH X RAY DIAGNOSIS

BY IRVING F. STEIN, B.S., M.D., CHICAGO

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THE condition known as eventration of the diaphragm is not really a diaphragmatic hernia, but a diffuse relaxation of half of the diaphragm simulating a hernia. Griffin (1) suggests elevation of the diaphragm as a better name. It is generally considered a congenital condition the left half usually being involved. The diaphragm loses its muscular quality and becomes a fibrous membrane with atrophy and fatty deposit. The degree of eventration varies greatly and may reach the level of the second rib.

The exact cause of the condition is unknown. Baetge (2) acknowledges that it is a developmental anomaly. Vogel (3) holds that it is due to congenital predisposition with degenerative changes in the muscular fibers. Motzfeldt (4) has found atrophy of the phrenic nerve on that side and offers three hypotheses: (1) Primary aplasia of the musculature with secondary atrophy and degeneration of the phrenic nerve; (2) primary aplasia and atrophy of the phrenic nerve with secondary muscle degeneration; (3) both together. Trauma has been offered as a cause in only one case—that reported by Reuss (5) in which a man 46 years old who was always accustomed to hard work, sustained a fall after which he suffered marked palpitation and cyanosis with displacement of the heart to the right. The X ray revealed the diaphragm on the left side at the level of the third rib.

This condition may exist for some time without symptoms, as evidenced by the fact that the majority of cases reported were adults. In all marked cases dyspnea, cyanosis and palpitation are present on the slightest exertion due to the pressure of the abdominal organs on the heart and lungs; also difficulty is encountered in lying upon the healthy side. Pain is an inconstant symptom; constipation is usual and dysphagia

paradoxa and hæmatemesis are occasional. Upon examination the abdomen is often found retracted with the chest flaring below with an increase in size of the affected side. In children there may be respiratory protrusion between the ribs. The heart usually is displaced to the right—markedly so in the cases recently reported. Over the affected side the chest is tympanitic, with gurgling sounds and absence of breath sounds.

The diagnosis is very difficult even in the most extreme cases without the aid of the X ray. With the fluoroscope the paradoxical respiratory phenomenon may be demonstrated and the roentgenogram usually portrays the remains of the diaphragm as a fine line above the visceral mass. With bismuth in the stomach or colon the X ray diagnosis is made certain. Griffin holds that the appearance of bismuth in the colon above the bow like line of the chest is conclusive evidence of diaphragmatic elevation or hernia.

In the differential diagnosis it is most difficult to distinguish between eventration and a hernia through a large congenital defect. Other conditions to be considered are pneumothorax, especially when associated with dextrocardia, subphrenic abscess, pyopneumothorax, and oesophageal diverticulum. Cohn (6) reports one case which had been diagnosed cardiospasm by competent clinicians in which the X-ray revealed an eventration of the diaphragm. Motzfeldt's case—a woman 41 years old—had previously been reported by Hüst in 1911 as a case of dextrocardia, and at autopsy the diaphragm on the left side was found at the level of the second interspace although its insertion in the thorax was normal.

At post mortem it may be found that any or all of the abdominal organs may be in the chest. The heart is usually displaced to the right and often enlarged and the



Fig. Roentgenogram taken on fourth day of life. Apparent absence of diaphragm on the left side. Rib bones shadow in the chest. Retraction of abdomen.

lungs compressed. Other congenital anomalies occasionally are found, as in the case reported below, in which the testicles were found undescended. Only one case of right iliac evagination was found in the literature (7).

The name eventration diaphragmatica was given by Petit in 1790. The condition was noticed earlier as 84 by Pyl and typical case reported by Frazer in 1857 occurring in a 10-year-old girl. Petit first differentiated it from the usual diaphragmatic hernia. The latter is a surgical condition while eventration of the diaphragm is not.

According to Vogel and Ciffin there are about twenty cases reported up to 1912. Malsfeldt, however, only recognizes those in which the diaphragm is described as fibrous structure and not merely elevated. He collected eleven cases up to 1913 and reported one more. Subsequent to his article I have been able to collect six cases reported: a eventration of the diaphragm by Baetge (2); Haase (8); Reuss (5); and

Kayser (9) in all of which (still living when reported) X-ray diagnosis was made. Whether Scheideffern's (10) two cases are included in Malsfeldt's report I do not know as his bibliography is not complete.

I wish to report another case of congenital eventration of the diaphragm in which the X-ray diagnosis was made a few days after birth.

It is G. born in the maternity department of the Michael Reese Hospital in the service of Dr. Emil G. Simon on June 4, 1913. The mother, a Russian, aged 31, a 11 para., bore first child healthy and normal. A Wassermann test made on the mother negative. The child born at 38 weeks gestation with the cord wrapped once about the neck. Otherwise labor and delivery were normal. At birth marked asphyxia in that as pressure was applied to the chest no effort at expiration as made until artificial measures (Byrd's method of resuscitation and iron lung) were employed for twenty minutes. Cyanosis did not, the chest disappeared and the pulse and respiration were very rapid. Examination at this time revealed distended abdomen, scaphoid belly and undescended testes. A soon after expiration was established the child put in the stock-tank, external



Fig. Roentgenogram taken three and six hours after insertion of breast-feeding. Stomach and bowels in chest.

heat was spilled and breast milk dr given every 4 hours with a medicine dropper. The birth weight was 33 gms.

June 6 Great difficulty was encountered in nursing, with marked cyanosis and convulsive movements when at the breast. The infant was taken from the breast and given mother milk by bottle.

June 7 Respirations continued very rapid, and spells of very marked cyanosis occurred. Minimum temperature was . Weight 300 gms. Physical examination revealed the left chest tympanic, the whole abdomen dull, and the edge of the liver not palpable. The belly was markedly retracted. The bow-line of the chest was flaring. Gurgling sounds were heard in the left chest and breath sounds were heard only in the right chest posteriorly. The heart beat was rapid, but the tones were clear.

June 8 the fourth day of life. The general condition as improved feeding retained and there was no vomiting. A roentgenogram (Fig. 4) taken by Dr. Frances Turley revealed the heart in the right chest and liver on the right and . There was an apparent absence of the diaphragm on the left side with the bowel shaded in the chest. The infant was placed on its left side with the head somewhat elevated, to relieve as much as possible the pressure on the thoracic viscera. The feedings were increased to breast milk once every 4 hours.



Fig. 4. Roentgenogram taken immediately after ingestion of bismuth. Demonstrating stomach high in chest.



Fig. 5. Roentgenogram taken soon after death with bismuth in the bowels. Only lower lobe of right lung admitted the bismuth contrast. The gas distention of the stomach and bowels here beautifully portrays the extent of eventration.

June 9 The general condition was good. Cyanosis as less marked. Weight 340 gms. An attempt to give a bismuth and starch enema for an X-ray picture of the colon failed.

June 10 Weight 355 gms. Temp. 97.4. Feedings were increased to once every three hours. Bismuth subcarbonate was given in the early morning feedings and roentgenogram (Fig. 5) was taken three and six hours after ingestion. Another feeding was then given and a second picture (Fig. 5) immediately taken. As seen on the accompanying roentgenograms, the stomach and part of the small and large intestine were found high in the left chest and the heart pushed to the right.

June 11 A spell of deep cyanosis was noted after attempt to nursing again. The protocol recorded that the cord as fixed the navel was in good condition. Temperature 98.6° respirations 20. Weight 300 gms.

June 12 A crying spell with marked cyanosis as noted. Temperature . respirations 20. Weight 335 gms.

July 1 The general condition was improved. The cyanosis was less marked, and the infant nursed at the breast with little difficulty. Weight 355 gms. Temperature 98° respirations 26.

July 9 The course for the past week has been



Fig. 5. Photograph showing the relations of the ectopia to the thorax.

uneventful but to-day a severe crying spell occurred, with very deep cyanosis, so that the child's condition looked desperate. Stimulation gave some relief. The mother was discharged from the hospital, and the infant transferred to the Sarah Morris Hospital. The weight was 3305 gram., only 5 gm. below the birth weight. Admitted to the Sarah Morris Hospital in the medical service of Dr Ernest Lackner. Soon after admission another severe crying spell occurred, with marked cyanosis. Dysphagia was also noted. Temperature 36.6° pulse 160, respirations 44. The cyanosis cleared somewhat and breast milk on 3 was taken in the evening. The infant passed fair night but appeared very weak in the morning.

July, the twenty-seventh day of life. At 11 A. M. the child suddenly became very cyanotic and dyspnoeic. All attempts at stimulation failed. The condition grew gradually worse in spite of all heroic measures and exitus occurred at 4 P. M.

An autopsy permit was obtained from the mother before posting however a tracheotomy was performed and a bismuth emulsion injected into the bronchi to determine the amount of functioning lung. The roentgenogram (Fig. 4) revealed what later was found to be the case namely that the lower lobe

of the right lung was the only portion which contained air. This picture also gives the best view of the ectoposition.

The abdominal parietes were opened in the usual manner and the anterior chest wall removed without disturbing the lower rib border and a photograph taken (Fig. 5) before disturbing any of the relations. Examination revealed a typical ectoposition of the diaphragm with the stomach, the greater part of the small and large intestine, the spleen, the left lobe of the liver, the tail of the pancreas, and the upper pole of the left kidney in the chest. The heart was found greatly enlarged and pushed extremely to the right. The lungs were found above and to the right of the diaphragm, all compressed except the lower lobe of the right lung. The diaphragm on the left side was found to be a fibrous dome, thin and gray in appearance, extending to the level of the second interspace, in which no muscle fibers were seen. The remaining abnormality was that of undescended testes, which were found in the abdomen. The viscera were removed *in toto* and preserved in Kanzerling.

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COMPLICATIONS FOLLOWING SURGICAL OPERATIONS

A REPORT OF THE COMPLICATIONS IN A SERIES OF 6,825 SURGICAL OPERATIONS PERFORMED
IN THE MAYO CLINIC IN THE YEAR 1913

B. E. H. BECKMAN M. D. ROCHESTER MINN. 507

THE keeping of an accurate account from day to day of all the complications that occur following surgical operations is found to be an exceedingly valuable procedure. It allows one to sum up from month to month and year to year his failures and compare them with those of previous years. If this is not done the small failures in surgical work are soon forgotten and the surgeon is inclined to feel that his results on the whole are better than they actually show when appearing in cold figures. It is comparable to a business firm balancing its books at the end of a period of business and is the only true way of acquiring an accurate knowledge of the results in surgical work. If there is not a marked improvement in a diminishing number of complications one must conclude that the cases have been exceptionally unfavorable or that his technique is not improving. As was stated in a previous report, we find that this procedure has revealed many errors in technique which it has been possible for us to overcome.

In reporting the complications that occurred in the Mayo Clinic during the year 1912 it was stated that bacteriologic cultures would be made in the future from all wounds that did not heal primarily. The greater part, but not all were subjected to bacteriologic investigation up to that time. In explanation, it should be stated that all wounds were considered as possibly infected in which there was an escape of fluid at any time during the patient's residence in the hospital. In order to secure perfect conalescence it is believed that if the technique at the time of operation is as near perfect as our present knowledge of surgical methods allows all wounds which are not drained should be dry at the time of leaving the operating room and should remain so until healing has occurred.

It is interesting in this connection to note

that under this plan there occurred an escape of fluid from the wounds in thirty five patients, cultures from which developed no growth. We therefore consider that these wounds were not infected in the ordinary sense of the word but that irritation or a slight accumulation of blood placed so much work upon the tissues in the neighborhood of the wound that this extra fluid could not be absorbed readily and though sterile was finally discharged from the wound.

In last year's report, the statement was made that it appears in this clinic that most infections come from the tissues of the patients rather than from some outside source such as suture material dressings or instruments. In examining the bacteriologic report for 1913 this opinion seems to be verified to a marked degree since almost every organism identified is an organism which is commonly present in the body fluids or tissues and that these organisms are of the type that are readily destroyed by the methods of sterilization in common use in surgical clinics. Since we know that it is impossible to kill bacteria in the tissues of the body without destroying the vitality of these structures, and that the accessories used in the operating room such as gloves instruments suture material and dressings, can readily be sterilized, it seems more reasonable to assume that the infection comes from the patient rather than that it is introduced into the patient from some outside source. We realize, however that this cannot always be proved, but repeated bacteriologic examinations of dressing suture material, water etc. used in our clinic have failed to reveal any living organisms.

The report this year includes 6,825 cases comprising the in-patients of St. Mary Hospital. These are the patients who had a sufficiently serious type of operation to require them to remain in the hospital during their convalescence. It does not include the

TABLE 4

CASES HAVING MORE THAN ONE ORGANISM

	Staph. albus	Staph. aureus	Staph. aureus	Staph. aureus	Staph. aureus	Staph. aureus	Staph. aureus	Staph. aureus	Staph. aureus
Left breast									
Total abdominal hysterectomy									
Double pyeloid incision									
Double inguinal incision									
Ventral hernia									
Resection stomach									
Gastro-enterostomy and Append									
Total abdominal hysterectomy									
Gastro-enterostomy and append									
Appendectomy									
Femoral incision									
Appendectomy									
Tuberculous glands of neck									
Abdominal hysterectomy									
Subcutaneous glands									
Appendectomy									
Abdominal hysterectomy									
Posterior gastro-enterostomy									
Tuberculous glands of neck									
Abdom. hysterect. and append									
Hyster. ovary and tube									
Black neck									
Appendectomy									
Appendectomy									
Tuberc. ovary									
Nephrectomy									
Appendectomy									
Hyster.									
Resection stomach									
Appendectomy									
Gastro-enterostomy									
Appendectomy									
Anterior gastro-enterostomy									
Total abdom. hysterectomy									
Thyroidectomy									
Total	1	1	1	1	1	1	1	1	1

monary complications have been classified in five groups.

Group 1 Acute post-operative congestion of the lungs Into this group are placed those patients who disclosed acute congestion or an excess of secretion in the air passages as soon as they were returned from the operating room or within twenty four hours thereafter. Many of these cases were patients that were on the verge of an acute cold but had not revealed sufficient symptoms prior to the operation to warn the operator against proceeding. Certain others were patients that had vomited and sucked into the air passages infectious material from the mouth and pharynx. Others were probably those that had congestion due to prolonged cooling of the air passages from a long anesthetic. We know that an excess of secretion in the air passages is due to irritation so that we assume the excess in

these cases must be due to some form of irritation.

TABLE 5

ACUTE POST-OPERATIVE CONGESTION OF LUNGS

Anterior gastro-enterostomy and appendectomy	
Excision duodenal ulcer and cholecystectomy	
Appendectomy	
Resection of stomach	
Inguinal hernia	3
Appendectomy and extra-uterine pregnancy	
Cholecystect., appendectomy and gastro-enterostomy	
Gastro-enterostomy and appendectomy	
Posterior gastro-enterostomy	3
Splenectomy	
Cholecyst-jejunostomy	
Appendectomy and ileo-ileostomy	
Exploration of abdomen	
Cholecystectomy and choledochotomy	
Colostomy and resection of colon and urth bladder	
Cholecystostomy and appendectomy	

Total

Group 2 Pleurisy Patients having a pain in the chest with or without a slight rise in temperature and a slight cough without expectoration are classified in this group. There is often no cough or increase in temperature but the presence of pain and a pleuritic rub on auscultation. The symptoms last from a few days to a week rarely longer. I believe that patients operated on for pathologic conditions in the upper abdomen often have pleurisy as the result of the post-operative inflammatory reaction extending to the diaphragm and pleura.

TABLE 6

PLEURISY

Gastro-enterostomy	1
Superficial hysterectomy	
Cholecystectomy	3
Resection of stomach	
Laparotomy for pelvic inflammation and appendectomy	
Appendectomy and Baldy Webster	
Cursette and Baldy Webster	
Appendectomy and ing. herniotomy	
Nephrectomy	
Vaginal hysterect. and perineor	
Thyroidectomy	
Cholecystostomy and appendectomy	
Left colostomy	
Choledochotomy	

Total

8

Group 3 Bronchitis In this group are the patients who have an excessive secretion in the air passages. Many of them have only a slight rise in temperature for a few days and

expectorate an excessive amount of mucous or mucopurulent material. Others have a temperature of 102° to 103° F with increased respiration but the symptoms subside quickly and the temperature drops to normal in from 48 to 72 hours, although the cough and expectoration may continue for several days longer. The physical examination discloses no areas of consolidation in the lungs. It is often difficult in these cases to differentiate between a congestion of the lungs or more properly a congestion of the mucous membrane of the air passages and a true bronchitis.

TABLE 7

ACUTE BRONCHITIS

Appendectomy	3
Post-operative ventral hernia	
Urethrect., ureterect., cholecystect., and appendectomy	
Append. post. gastro-enterostomy	
Baldy-Nichol and constrictor	
Abdominal hysterectomy	
Cholecystectomy	
Excision cancer of stomach	
Cholecystectomy and cholecystectomy	
Excision duod. ulcer and pyloroplasty	
Pyloroplasty Piloni	
Nephrectomy	
Lig. right superior thyroid arteries	
Closure fecal fistula and app	
Closure fecal fistula	
Excision duod. ulcer and gastro-enterostomy	
Gastro-enterostomy	
Total	—

Group 4 Bronchopneumonia These patients have the same symptoms as those of the preceding group usually to a more marked degree. Inflammation here has apparently extended at certain points from the air passages into the tissues of the lung and the physical examination reveals areas of consolidation or congestion. Convalescence is slower than in the previous group.

TABLE 8

BRONCHOPNEUMONIA

Append. tonsy	
Excision pylorus	
Gastro-enterostomy; bariatric and appendectomy	
Posterior gastro-enterostomy	
Cholecystectomy and appendectomy	
App. (acute abscess)	
Thyroidectomy	
Cholecystectomy	
Exc. app and post-operative ventral hernia	
Pyloroplasty	
Total	—

Group 5 Lobar pneumonia In this group are those patients who have a definite consolidation of the lung with a temperature of 102° or more and the classical symptoms of pneumonia. The temperature is more likely to subside by lysis than by crisis. We still believe that septic emboli cause many of these conditions. They rarely occur earlier than the third or fourth day following operation.

TABLE 9

LOBAR PNEUMONIA

Cholecystenterostomy	
Pyloroplasty	
Appendectomy	
Abdominal exploration	
Cholecystectomy and cholecystectomy	
Cholecystectomy	
Thyroidectomy	
Cholecystectomy and appendectomy	
Gastro-enterostomy	
Total abdominal hysterectomy	
Anterior gastro-enterostomy	
Total	5

THROMBOPHLEBITIS

The total number of cases having a thrombophlebitis was 14. Table 10 shows the number upon the right and left sides with the type of operation. We have not been able to determine any method of lessening this annoying complication. Most of our patients upon whom abdominal operations have been performed are out of bed by the eighth to the twelfth day except those who have had simple appendectomies; these are allowed to get up on the sixth or seventh day following operation. There is a higher proportion of thrombophlebitis on the right side than has occurred in previous years. In our experi-

TABLE 10

THROMBOPHLEBITIS

Right Left

Nephrectomy		
Exc. duod. ulcer, cholecystect. and appendectomy		
Abdominal hysterectomy		
Cholecystect. and ant. Hartman		
Abdominal myomectomy		
Vaginal hysterectomy		
Abdominal hysterectomy		
Cholecystectomy and appendectomy		
Drainage large pelvic abscess		
Gastro-enterostomy		
Removal ovarian cyst with twisted pedicle		
Total	6	8

ence patients with infection are not more prone to have thrombophlebitis than the so-called clean cases

Acute Dilatation of the Stomach. It is to be seen that during the year this complication occurred in but three instances. We believe this distressing complication has been avoided by frequent and early lavage. A patient who continues to vomit after the first twenty-four hours is placed upon routine lavage. The stomach is washed once or twice a day or oftener if it seems advisable until vomiting ceases

The other complications listed herein are such as are apt to occur in any large surgical clinic, but are not in sufficient numbers to warrant conclusions being drawn

ACUTE DILATATION OF STOMACH

Cholecystectomy and appendectomy

Cholecystectomy and choledochotomy

Total

—

EMPHYSEMA CORDIS

Transplantation right ureter for entrophy bladder

3

OBSTRUCTION OF BOWELS

Resection of stomach

Resection of urinary bladder

Nephrectomy

Total

—

SURGICAL BASE

Suprapubic prostatectomy

Appendectomy and castration

Ligation right superior thyroid artery

Cholecystectomy and anterior Hartmann

Total

—

CYSTITIS

Resection of rectum

Vaginal hysterectomy

Appendectomy

Total

—

POST-OPERATIVE MISCELLANEOUS

Appendectomy

NEURITIS

Appendectomy (ischialic)

Subtotal abdominal hysterectomy (arm)

Total

—

ARTHRITIS

Appendectomy

Posterior gastro-enterostomy

Total

—

TONSILLITIS

Ligation superior thyroid vessels

Appendectomy

Total abdominal hysterectomy

Bakky-Webster operation

Removal lithopodion

Total

—

DILATATION OF HEART ACUTE

Thyroidectomy

Ligation one superior thyroid artery

Total

—

DEGLUTITION TUBERCLES

Inguinal hernia

3

SLIGHT BLEEDING FROM WOUND IN CASES

WITH MARKED JAUNDICE

Cholecystectomy and choledochotomy

Secondary choledochotomy

Total

—

URINARY FISTULA

Total abdominal hysterectomy and removal of

portion of bladder

Supravaginal hysterectomy

Total

—

NEURALGIA

Transplantation of one ureter

PAROTITIS

Abdominal hysterectomy

Posterior gastro-enterostomy

Ovarian cyst-dermoid with twisted pedicle

Total

—

SCALD TIT

Choledochotomy and cholecystectomy

ANGREATHIC FISTULA

Choledochotomy and cholecystectomy

FISTULA FROM GASTRO-ENTEROSTOMY

Gastro-enterostomy and cholecystectomy

PERI-EMPIEUM (ACUTE)

Cauterization of cancer of cervix

There were no fatalities included in the cases reported above.

HYSTEROHYMECTOMY ITS EVOLUTION AND PERFECTION

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WE are living in an age of marvelous scientific achievement. The advance of the science and art of surgery has been so rapid and new methods are so quickly evolved that we need at times to trace the steps by which we have attained existing results. Not only is such a retrospect interesting but in many ways instructive and profitable. It is not at all uncommon in studying the history of an operation or other therapeutic resource to find the method adopted finally had been previously used and discarded. Thus in the light of experience and improved knowledge it is often necessary to retrace our steps and restore old methods to the place from which they had been stricken. A notable illustration of this fact will be found in the narrative I herewith present of the various steps by which the present surgical treatment of uterine fibroid tumors has been established. It will be noted that in the first operations for removing these tumors by hysterectomy the uterine cervix was ligatured and dropped in the pelvis. After many years during which the pedicle was fixed in the abdominal incision by the aid of the serrator-cramp or elastic ligature the original method with certain modifications, was restored and remains in universal use. The one persistent and universal characteristic of all perfected surgical procedures is simplicity. As knowledge advances and precision increases operative methods become more direct and uncomplicated.

The purpose of this paper will be best subserved by omitting a detailed account of the early surgery of fibroid tumors of the uterus. In most instances the earliest operations were stumbled upon when the operator expected to do a craniotomy. A craniotomy American surgeons were prominent in the pioneer work of this operation and have contributed the most essential features of the operation now so successfully practiced in this country. The names of Charles Clay

and Spencer Wells in England, Burnham, Kimball and Washington Atlee in America, Koeberle, Schroeder and Hegar in Germany, and Pean in France are associated with the foundation and early history of the treatment of uterine fibromata by abdominal section and excision of the tumor. So great was the mortality following the operation in the hands of its founders that it was not adopted by surgeons generally. With the exception of a few bold spirits who struggled on despite all discouragements and in the face of repeated disaster the operation was regarded with disfavor. This was the status of the operation from its foundation in 1843 up to the advent of the Listerian era in surgery. The mortality of the operation during this period in the hands of skilled operators was from 10 to 40 per cent.

In 1885 Thomas Keith of Edinburgh, based a report of forty cases of fibroid tumors of the uterus treated by abdominal hysterectomy. This series embraced all the operation he had done up to that time and extending over a period of twelve years. In all these cases the pedicle was treated extra peritoneally with the serrator-cramp or clamp. In all of these cases some antiseptic measures as taught by Lister were applied. In some the carbolic spray was used, and later abandoned. In the series of forty cases there were four deaths. As the antiseptic measures were crude and imperfect the convalescence was in most cases protracted and febrile but the results were so much superior to any previously recorded that the operation was established in professional confidence. Dr. Keith was at this time at the height of his physical and mental powers, and exercised a powerful influence upon surgical opinion throughout the surgical world. His monograph publishing in detail his work in this field is a model of its class. Indeed it should hold a place among the classics of gynecological literature. If I may impose upon your indulgence for a momentary digression, I

would quote one sentence from the introductory chapter of this book. Commenting upon the beneficent offices of the antiseptic system of Lister he writes these words "It is, unfortunately a melancholy story that ever since surgery began, the most of the mischief was done by the surgeon himself. It was the willing and tender though *wudean* hand that carried the poison into the wounds.

Lawson Tait, of Birmingham, the founder of modern gynecology and the greatest surgical genius of his time was born and educated in Edinburgh and was a frequent visitor there after taking up his residence in England. He witnessed Keith's operation and with that skill which made him famous applied it in practice. He adopted the serrenocud and treated the pedicle as Keith did and even surpassed him in the technique of the operation. He did more than any other operator to establish the operation in universal favor throughout the world. There was no marked improvement by these great Scotch surgeons in the operative technique of Koeberle, Atlee and Pean previously described. The marvelous improvement in results was due to the application of Listerian principles and the elimination of sepsis. The same may be said of the work of Bantock and Thornton in London, who worked along these lines.

Up to this time the belief was firmly fixed in the surgical mind that the cervical pedicle offered peculiar difficulties. If ligatured and dropped, the tissues would retract and slip from the grasp of the ligature and fatal hemorrhage would follow. Sloughing of the strangulated tissue and fatal peritonitis were attributed to the intraperitoneal stump. The serrenocud was invented and used to avert these dangers. After tying off the broad ligaments the pedicle was drawn up into the lower angle of the wound pins were applied to retain the pedicle *in situ* the serrenocud was placed and tightened and the tumor cut away. Some operators replaced the serrenocud with the elastic ligature, and another refinement consisted in stripping the peritoneum from the cervical pedicle and stitching it to the adjacent parietal peritoneum so as to assure an extraperitoneal

fixation of the pedicle. But the sloughing of the stump the protracted convalescence the discomfort to the patient, and the frequency of post-operative hernia impelled surgeons to seek a method more surgical and refined. Many ingenious efforts were made to replace the extraperitoneal nœud with an intraperitoneal ligatured or sutured stump but without avail until the procedure now to be mentioned was devised.

In 1889 Lewis A. Stimson, of New York, proposed and practiced the ligation of the four trunk arteries (the uterine and ovarian on each side) in their course. In this way mass ligatures were done away with and the danger of hemorrhage and sepsis enormously reduced. Following upon this J. Riddle Goffe in 1890 made his valuable contribution to the technique of the operation, which consists in providing peritoneal flaps for the cervical pedicle so that it becomes extra-peritoneal and at the same time intrapelvic. Other and important details were worked out by Dudley Pryor F. H. Martin, and Kelly and in 1891 B. F. Baer of Philadelphia published the systematic application of these various modifications in the method of supra-vaginal hysteromyomectomy with extra-peritoneal dropped pedicle as now generally practiced. Various modifications have since been added to perfect details of technique. The operation was markedly advanced by the use of catgut throughout for ligatures and sutures, the adoption of the Trendelenburg position, and the use of rubber gloves. Without enumerating the numerous suggestions of various surgeons such as cauterization and excision of the cervical mucosa in treating the pedicle the operation as now done in America is as follows:

The patient is placed in the Trendelenburg position and the abdomen opened with a free incision. After exploring the tumor with the hand and separating adhesions, the tumor and uterus are delivered through the abdominal incision. The intestines are carefully packed off with gauze so as to expose the contents of the true pelvis. A heavy volsellum forceps may be necessary to secure delivery of the tumor. The broad ligaments are secured on each side with clamps and

divided between two clamps down to the base of the tumor and near the uterine cervix. The peritoneum on the anterior face of the uterus and broad ligaments is divided the incision extending from one round ligament to the other and the vesical peritoneum is then freed and pushed downward with a piece of gauze. Traction is then made upon the tumor which is rolled over to one side and the uterine vessels are exposed by separating the broad ligament with a gauze sponge. The uterine artery is then secured low down on the cervix with a clamp. A ligature may be applied at this stage of the operation or the vessels secured by the clamp until the tumor is removed. The same procedure is carried out on the opposite side. The cervix is divided below the level of the internal os, an effort being made to remove a wedge-shaped piece from the cervix, and a small posterior flap is formed by stripping up the posterior cervical peritoneum while the section of the cervix is being made. The cervix is closed with a few interrupted catgut sutures, thus making hæmorrhage complete. The four trunk arteries, now securely clamped are carefully ligatured with No. 2 catgut; the anterior and posterior flaps of peritoneum are now sutured across the floor of the pelvis and over the cervical stump with a continuous catgut suture. When there is a tendency for the cervix to prolapse the upper border of each broad ligament together with the round ligament may be sutured to the cervical stump before covering the stump with the peritoneal flap. The peritoneal flap should be drawn snugly over the cervix so as to prevent the formation of a dead space. The pelvis is now cleansed of clots with the aid of gauze wrung out of normal salt solution, the gauze pack gently removed, the patient placed in the horizontal position and the abdomen closed. In removing the tumor and while dealing with the broad ligament for obvious reasons one or both ovaries should be preserved whenever it is practicable to do so. Even a part of one ovary should be retained if possible.

The advantage of this operation over all other operative procedures which have been devised for the removal of fibroid tumors

by abdominal hysterectomy is its wide applicability. However irregular the growth may be and however varied its morphology the experienced operator will usually be able to work a path to the cervix and obtain a good pedicle. It is rare that the cervix is so involved in multiple tumors that it cannot be isolated and retained in place. The procedure has a distinct advantage over other methods. In the reasonable time limit with which it can be carried out. By retaining the cervix the normal floor of the pelvis and relation of the vagina to adjacent structures is anatomically preserved. The objection has been made that the retained cervix may become the seat of malignant disease but this is very rare. In a very extensive experience with the operation, covering several hundreds of cases some of which have been under observation for years, I have known only one instance in which cancer developed in the cervical pedicle after hysteromyometomy. In my entire experience I have never injured the ureters in this operation. The mortality of this operation in average cases and at the hands of skilled surgeons is about 2 per cent. I submit that by no other procedure can these results be equaled.

In 1888 M. A. D. Jones performed the first total hysterectomy for uterine fibroma in America. Bardenheuer had preceded this operation but his work was not known in this country at that time. This operation, known as panhysterectomy, has been modified in various ways. It has been practiced as an additional step in the operation I have described, the tumor being cut away from the cervix, the cervix seized with a volsellum for forceps and then removed in its entirety. Another method is that known as the combined operation and consists of a preliminary vaginal dissection of the cervix followed by abdominal section and hysterectomy as already described. A third method and one favored by many surgeons is that of Doyen. In this operation the uterus and the tumor are brought forward and over the pubes, the posterior vaginal fornix is opened through the pouch of Douglas, the cervix is drawn through the posterior vaginal walls laterally

and in front. The broad ligaments and uterine vessels are clamped if necessary and by continuous incision the fibroid is stripped out of its attachments. After the uterus has been removed the adnexa are dealt with as indicated the vagina closed with sutures and the peritoneum united over it.

Time will not permit bare mention of the numerous procedures devised by surgeons of all countries during recent years to cope with atypical cases and special complications in operating for uterine fibromata. These tumors grow in the most fantastic way and dispose themselves with relation to the peritoneum and adjacent structures in great variety. Among the numerous methods devised for atypical cases one of the most

valuable is that of bisection as practiced by Kelly.

With these various procedures the modern surgeon is prepared to cope successfully with every form and variety of uterine fibroid tumors, and will be prompted by sound surgical judgment to elect the procedure best suited to the case in hand. As a result the operation has become in the hands of trained gynecological surgeons the most successful major operation known to surgery. It is not the purpose of this paper to offer any new theory in pathology or to present any unique operative procedure but rather by going over familiar paths which those here assembled have trod to confirm for the present at least the faith that has been tried and proven.

EFFICIENCY ENGINEERING IN PELVIC SURGERY ONE AND TWO-SUTURE OPERATIONS¹

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THIS paper is a plea for systematic study of our efficiency. If other handcraftsmen are employing experts to teach them how to eliminate waste motions and how to standardize technique, it behooves us to further such investigations in operating room in ward, and in office. For beyond any other craft the surgeon's work demands the new scientific management. It is not only that on occasions time is a matter of life and death. It is not only that speed is a matter of lessened shock and quicker recovery. It is mainly that habits of hand work controlled in the ways of the best motions by the automatic lower centers bring about freedom of the higher brain for those weights, decisions, that concentration on the rest of the problem and that watchfulness of the patient which are called for in nearly every operation. No item is too small to think of no training too laborious. All the way from printed directions for office patients up to dissection in the most radical cancer operations there is

hardly a detail unworthy of consideration. The present question is how to attack the problem. It must first be defined its parts allotted, the tentative results published for test by a number of operators, and a clearing house devised for combining conclusions. Meanwhile let us glance at some aspects of the matter.

Hospital Standardization. Toward the standardization of medical schools, here and abroad a long first step was taken by disinterested outside study.² Whether we agree or disagree with the premises on which the estimates were made it is evident that the scope of the plan and the publicity cannot but be beneficial. The next great step is inspection and standardization of hospitals. This also must be undertaken in a large-minded way. In the October number of *The Modern Hospital* the editor Dr. J. A. Hornsby author of the recent book of the same name, takes the ground that the

¹Corcoran Foundation Reports on Medical Education, Bulletin 4, 1922.

²The Modern Hospital, Saunders, Philadelphia, 1922.

Read before the Chicago Gynecological Society November 5, 1921. (See discussion p. 569.)

physician is too close to the problems to solve them properly and that he is often handicapped by working for a single department of his science. He argues, therefore, that one of the great foundations should make the investigation.

Does part of this investigation and standardization belong to our profession? I should say that the general surgeon or the special surgeon could best aid this work by analyzing a number of every-day procedures in the operating room or the ward leaving questions of administration, of nursing organization of feeding of supplies, and the like to be studied by the efficiency engineer. The time has come to urge that the national societies combine to undertake specific work in this direction.

In hospital management until proper plans have been worked out perhaps the most effective control in professional matters is by the clean-cut responsibility of one man committees. For example the routine of the operating room is to be figured out, reduced to writing and carried through by one of the surgeons. A careful consensus of opinion on the part of the various operators is scheduled and an average or standard technique agreed upon. Thus let us say two lengths of ligature are specified as regular and three sizes of catgut and nine different needles which must always be ready. A routine form of skin preparation is to be employed unless a different one is specifically ordered. These are only examples. The individual equation and initiation are not handicapped but departures from standard are recognized as such and radical alterations are matters of conference or arrangement. Thus what was haphazard becomes systematized well understood economical of time and material. Histories are placed in the hands of one man, who enforces a standard nomenclature of diseases and operations and an irreducible minimum of entries the ward routine is in charge of another who sees that not tradition but typewritten regulations rule. The dispensary, in professional matters, is administered by a third. Subcommittees or sub-

stitutes are allowed but authority and responsibility are sharply defined.² Such men might be called the functional foremen of the health factory bound over either to make good or to make way being an effective executive committee presided over by the man who appoints them the president of the staff and reporting to the staff which is annually named by the trustees.

Clinical Travel—Too much stress cannot be laid on the astounding stimulus systematic visiting provides for the overhauling and practical review of one's methods and resources. Not sporadic and occasional visiting but that done at regular intervals with every second or third year a longer trip affording opportunity for making wide generalizations and time in which to do steady thinking. Any small group of men may within six years in reasonable vacations inspect all the best clinics in their own line in this country and in Europe.

In their travels selection may be made of those clinics whose efficiency will best repay an analysis looking toward the standardization of others. The example that springs first to mind is the Rochester clinic. The definition of authority responsibility and system in certain institutions the remarkable teamwork in individual operating rooms the laboratory equipment of some surgical departments the follow-up methods of others the impressive teaching devices of one man, the student's participation under another the high average technique of a whole city—the best can be selected for study and emulation.

Illumination—As an instance of the need of scientific studies let us take the subject of the illumination of the field of operation when that field is in a cavity like the vaginal canal or the laparotomy well. Gilberto all these has been laid upon the attempt to get light as brilliant as possible. One way is by large skylights and windows, another by electric bulbs with reflectors, a third by the beam from an arc light outside the room reflected from one or more mirrors, as in the larger German clinics. As far as I know no study

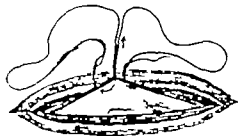


Fig. 1.



Fig. 2.

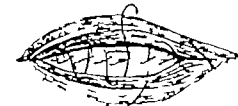


Fig. 3.

Fig. 1. Simplified method of closure of the abdominal wound, eliminating needle holder, several clamps, thumb forceps, and retractors. The peritoneum is picked up by middle stitch operator and assistant flip over toward the angles at the same time.

Fig. 2. The peritoneum is closed and the same stitch starts to close the muscle. It may be tied at each angle if desired.

Fig. 3. Longer sweep, approximates the muscle and the stitch is tied in the center of the wound.

has been made of the results in their bearing on the surgeon's retina. One's first idea would be that the brighter and more abundant the light the better. But this is not true. Indeed the paradox is truer that the more brilliant the general illumination the less will the eye see into deep caverns. The pupil contracts from the strong illumination of the entire room and particularly from the glare on white sheets and towels encircling the field. The eye is handicapped. With the beam thrown directly into the cavity the conditions are better but not yet right so long as the surroundings are all white. The most desirable arrangement would seem to be a room with ample light to enable the nurses



Fig. 4.

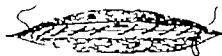


Fig. 5.



Fig. 6.

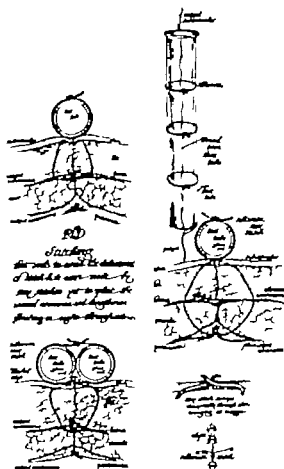
Fig. 4. The same strand goes on in two directions to close the fascia, beginning at the center.

Fig. 5. The fascial layer suture ends with tie at each angle; this usually completes the layer suturing.

Fig. 6. Longitudinal section of wound. If desired, the same stitch may be used as subcuticular stitching in the center of the wound with knot that hides itself beneath the skin.

to find instruments and thread needles with a beam of light thrown into the wound from more than one direction and the covers about the wound of a color of the same actinic value as the pink and red surfaces within. Black sheets look dingy. Red rubber (fortified with fabric) is an example of a color value of about the required intensity.

For night work it was long accepted that the ideal conditions for reading existed when, in a dusky room, a bright light was centered on the page as by a shaded lamp and in an operating room when a group of lights was equipped with reflectors to focus the light rays and with a glass screen to stop the heat rays. The eye men however have taught us that under these circumstances the pupil adjusts itself to the general darkness of the room and opens wide. Hence the spot of brightness hits the retina a blow. If this be true then in night operating with a brightly lighted field, the rest of the room should show diffused lighting and the environs of the wound a color value not far from that of the area on which work is being done. But this whole subject, as well as cross lights, sky



Figs. 7, 8, 9. May sutures that let no stick hole scar, the test tube being used as a guide and slanting grip of the side edges takes

light summer glare and so on call for the kind of study for which we plead

Abdominal Incision Suppose we select another every day problem for time study and motion study with the proviso that we all deprecate mere operating against the

General Principles of the Study of the Motion of the Hand and the Motion of the Foot (McKee)



Fig. 6. Needle in which thread joins in pointed eye so that it cannot slip out during operation (McKee)

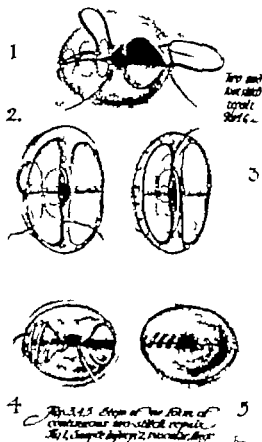


Fig. 10. Various forms of continuous suture as applied to an incision. These may be subcutaneous in location

clock. In closing the abdominal incision, what is the swiftest simplification compatible with good workmanship? Restriction of the number of assistants and tools and motions with selection of the best of these in the best sequence—that is the matter for study. The irreducible number of tools would be a needle and a suture. Can we dispense with needle holder retractors the several clamps used to pick up peritoneum and fascia and thumb forceps? Can some knots and sutures be eliminated? Can two men work simultaneously on the larger incisions?

Let us, then, on the simplest possible scale undertake various trials. Let us test this, for instance. A No. 1 plain or No. 6 chromic



8



Fig. 1. Continuous suture in amputation of the cervix by suture from each side.

catgut (20 to 28 inches long, according to the length of the incision) is armed at each end with a needle large enough to be manipulated without a needle holder and sharp enough to cut the skin but not to slice blood vessels (e.g. the Mayo-pointed). Two fingers pick up the peritoneum at the middle of the incision and the suture is passed first through one side and then through the opposite peritoneal edge. The strand is tied midway of its length. After tying traction lifts the peritoneum out of the wound in tent shape, exposing the upper and lower ends of the incision in this membrane (Fig. 1). The operator in a continuous whip-over closes the gap in the direction of the pubes, while at the same time his assistant, in all wounds but small ones, does the same in the direction of the navel. Having closed the peritoneum (Fig. 2) the same strand now doubles back in longer sweeps to approximate the muscle edges (Fig. 3) the two ends meeting in the middle of the wound to tie there. Next (if thought desirable) the same stitch may whip the fascial edges together (Fig. 4) tying at the upper and lower ends of the fascial incision (Fig. 5). Indeed one could

Fig. 3. Amputation of the cervix by continuous sutures, the start being made in the center line.

carry the scheme still further and use the same stitch for the fat layer or for a subcuticular if one elected to indulge his fancy to the limit (Fig. 6). Naturally if plain catgut is used silkworm stay sutures should supplement the support of the fascia. If one prefers plain catgut for the two lower layers and chromic for the fascia the center-started stitch saves time here also with incisions five inches or over. If stay sutures are employed these may be so placed as to leave no stitch hole scar by crossing them at their exit from the skin margins of the wound and tying them over a bolster which may be an ordinary test tube laid along the wound (Figs. 7 and 8).

The above are suggestions for trial. Many data there are to be worked out and individuals will give very different answers. The Michel clips for instance, are commonly used in Germany for closure of the skin because of the speed of the procedure and a long straight cutting needle like the Keith, facilitates the placing of the subcuticular suture. The end results as to suppuration, broad and tender and unsightly scars and



Fig. 4

Fig. 4. Hysterectomy of both hips. Direction in which continuous sutures should be placed.

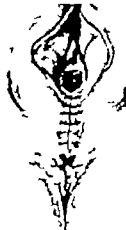


Fig. 5

Fig. 5. Perineal repair by chronic gut. Frequent purpy appearance of stitches as stitches drop out or are removed.

hernia—all these are matters for such study as we are here advocating.

In this connection one might propound yet another problem. What is the best method of shielding the abdominal incision from friction, contusion and infection. Concerning this I have long taken notes and have found precautions generally ignored or abandoned. I believe that no adequate solution has been worked out. Perhaps my shield retractor of rubber fabric with two prongs may prove to be such in untal cases (Fig. 21).

As a single example of the standardization of tools, a study such as we urge would make prominent a needle a device twenty years in use which seems to have escaped the notice of most surgeons, possibly because it was never published. A tapering eye jams the suture and prevents that not infrequent minor annoyance and delay the slipping of the thread from the needle. When well made it does not cut the suture. It would seem that this MacRae eye should become standard, perhaps the standard (Fig. 10).

One more example this time in training of right habits in handling instruments. Which is least fatiguing? The great German operators keep the gaze fixed on the field, reaching out a hand and calling for the next instrument. Thus the eye does not have to find an instrument and then re-focus on the exact

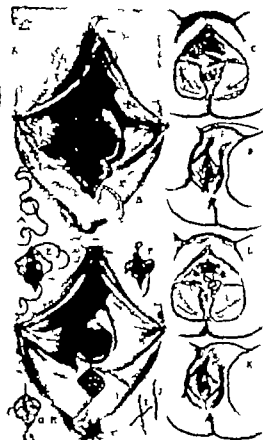


Fig. 6. Primary perineorrhaphy by layer suture, single strand, subcuticular. A anchoring in deepest portion of wound, particularly effective in irregular forms of tear. Result is accurate coaptation (L) almost invisible line of union (K).

point selected for suture or suture. Again, Dr F F Simpson does not have to look away from his work because each instrument, of those repeatedly used lies in its own place and there his hand finds it and there his hand replaces it. The commonality among us sheds an instrument somewhat haphazard and has not only to look but to search and select among a group, in recovering it. The new analysis studies all these ways. It might even consider whether a hand signal for an ordinary instrument might not save that delay or that mental annoyance of the moment when intent on a grave issue, one must withdraw one's mind to form and voice



Fig. 7 Secondary perineorrhaphy by continuous catgut suture and subcuticular suture. The test of the rectocoele (1-3) and the guide for the levator (4) being made by stick sponge in the rectum and show three and four layer method respectively.

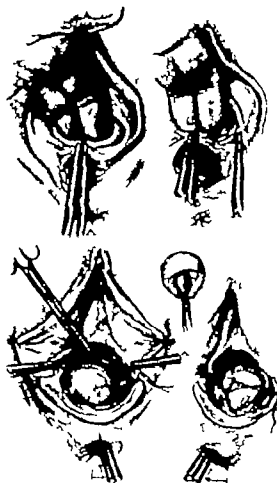


Fig. 8 The gauging of the amount of desiccation. Hooker clamp seize remnant of hymen and draw them over the fingers. b-lachase grip lift another pair of lateral vaginal walls scales test further in. Stick sponge in rectum facilitates suture of levator.

the word clamp or scissors. If Dr Cochem is trying with his trained crew to develop silent operations he might go further and develop what might be aptly termed pantomime operating. However this may be when we train golfers boxers runners to standard form and secure 100 per cent efficiency why not laparotomists.

Repair or Amputation of the Cervix by Continuous Suture — The usual cervix operation presents a tangle of multiple ties say four on each side. Each stitch is taken, clamped, laid aside until all are in place. Then they are unraveled from the bunch right and left and tied one by one each being again laid aside after tying. Lastly scissors are taken to the whole group. It is found that the same result may be attained by two continuous sutures, with four knots instead

of six eight or ten. Any one of three or four adaptations of the two-stitch method are available. A relatively thin cervix may be treated with a buttonhole suture with its crossings on the vaginal surface of the cervix (Fig 11 1') using one stitch for each side of a bilateral laceration. When the cervix is somewhat voluminous and the tear long, Pomeroy uses two layers. The first turn and tie of the stitch is placed high in the cervical canal laterally and then this lateral wall of the cervical canal is built down to the external os. From this point the same suture may be



Fig. 9. Primary perineorrhaphy. Its identification of torn layers and continuous suture of the injury by drawing the retracted muscle from the gully alongside the rectum forward on and the pubic arch.

continued outward under the vaginal surface of the cervix to the cervicovaginal junction (Fig. 11: 2 to 5). As a rule however both sides of the canal are built before the external portion is added.

In amputation of the cervix the sewing may be begun at the outer angle and run inward (Fig. 12). The best way however is to start the stitching by a center sweep with one end for the posterior and one for the anterior lip (Fig. 12: 8). Each end serves as tractor and as a guide to the median line. The end with the needle is then run as a continuous suture the rear stitch toward one side, the front stitch toward the opposite side (Fig. 13).

In those instances when pelvic floor repair

is postponed to some time between the second and tenth day post partum the uterine injuries should be mended at the same time. Continuous suture best effects this. A simple buttonhole stitch is easiest. If with two layers, one starts at the inner end within the cervical canal grasps almost all the thickness of the cervix, and thus works down to the external os. Thence a submucous stitch more or less exact runs along the vaginal aspect of the cervix if necessary (Fig. 13A). Pomroy begins on the vaginal surface of the cervix at the rear in double hysterotomies, by running or buttonhole suture next, the canal side then with the second stitch, the opposite canal side last, the remaining anterior vaginal aspect of the cervical lip (Fig. 14). In other words, the far side is done before the near side.

As skill is attained in all these procedures the outer layer is hidden so that no stitch and no knot is in view but only a line of coated incision.

Perineorrhaphy.—For saving time and elaboration in perineal repair the one strand, two-knot continuous suture has been found to be the simplest device. In most operations, whether primary or secondary the center of a long suture may sweep and tie in the deepest part of the wound (Fig. 16 A, B) then the two ends whip over one upward to close the vaginal gap (Fig. 16 E) and unite the mucous membrane over and over or by a submucous stitch (Fig. 16 F) the other downward toward the anus (Fig. 16 H) finishing as a subcuticular to tie to the first part (Figs. 16 I and K and 17 Fig. 7: 9). We are ready to declare that upon buried catgut of small size entire reliance may be placed for pelvic floor repair after labor. It is even more satisfactory than in secondary operation. In our 58 fresh injuries of various degrees primary union resulted in all but one. We used either interrupted stitches closed over by running intercutaneous facing suture with several strands, the last being sub-surface or else, as I prefer a single strand run as continuous tier suturing with two ends coming together one submucous, the other subcuticular the whole secured by one deep knot and one hidden surface knot. In any of these ways the

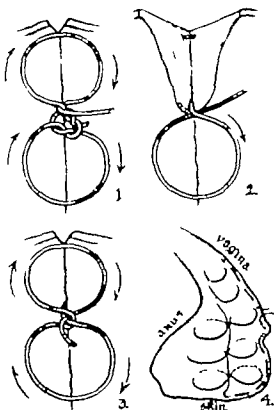


Fig. 20. Three tier suture, by the employment of the figure 3, which is continuous and middle-locking.

wound is practically invisible from the first. Levator laceration found immediately after labor particularly demands tier suture, and anterior fascial gaps are thus best united.

In late perineorrhaphy as now customarily done, where the levator muscle and fascia are drawn inward from the lateral sulci to be fastened side by side in front of the rectum (Noble) the single strand stitch works well. A convenient beginning may be made by placing the first sweep and tie at a point about two-thirds of the length of the suture and at the middle of the lateral bands that are to make the reinforced septum (Fig 18). Traction on this stitch pulls down within reach the spreading V of the bands higher up so that a sweep may be carried beyond to draw these together (Fig 17 5). This portion of

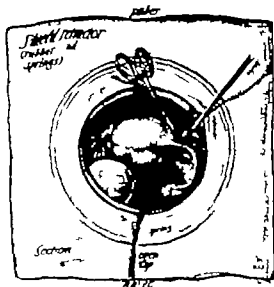


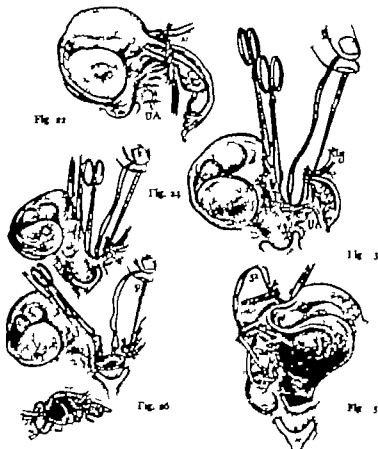
Fig. 21. Shield retractor guarding cut surfaces in abdominal wound.

the suture is thereafter of service to gather the rectal wall and to close the upper end of a Hegar triangle and eventually becomes a mucous membrane stitch or submucous lacing (Fig 17 6 x 9). The end then hangs loose to wait for the completion of the operation when it ties to the subcuticular coming back from the anal region (Fig 17 9')

Let us now return to the knot in the levator (Fig 17 "7"). To draw together these bands three stitches are often desirable. Two have been placed. The third is now swept about the edges, and best from left to right (Fig 20, 1') in order to make the next stitch effective. It then takes any available order. To close the transversus and sphincter vaginæ muscles and then the superficial fascia either two (Fig 20 4) or three more layers (Fig 17 11 and 12) are employed. The aim is to have brought together everything but the skin on arrival at that end of the wound nearest the anus so that the intercurettaneous work may proceed toward the hymen and meet the first end there. If there be tension a stay stitch or two may be used.

Such one-stitch repair is a matter of practice. On small injuries it is easy. On the larger it works well in properly selected cases.

In levator lacerations, primary and second



Figs. 22-26. Steps in the T-stitch abdominal hysterectomy. Each loop is drawn out before proceeding and kept taut, serving also as tractor. Into the deeply combed cervix—or vaginal edges—the round ligaments are made fast.

ary, the torn end of the pubo-coccygeus drops backward alongside of the rectal wall as in a more superficial plane the sphincter withdraws into a pocket. For anatomical replacement and the drawing forward of the hidden end toward the ramus the continuous suture is found to work better than the interrupted (Fig. 19.)

Hysterectomy—The elimination of waste motions in removal of the uterus led to combinations of ligature, suture and tractor in one, intra-abdominal work I owe to Dr F F Simpson, and the vaginal procedure is my application to the operation of Dr J Riddle Goffe. These methods are for the expert, and

even he may perhaps, at the first trial, combine the ligature with this suture.

In simple cases two sutures suffice. I sometimes use more. It is spoken of as a two-suture method because the work usually can be done thus. There has been no slipping, no hæmorrhage, no death, in a series of forty-two cases.

Abdominal Hysterectomy—The first bite of the suture is usually that which circles the round ligament (Fig. 21). The second stops bleeding from the ovarian artery (Fig. 22). In each case care is taken to bite into and

lock into tissue so that the ligature does not slip off a bared vessel. In every case and with every bite the loop must be snugly nestled home without slack or jump or stretch of gut between the bites, except as noted hereafter. Reflux being checked by a clamp on the uterine side the upper vessels are cut away (Fig. 23). The thin part of the broad ligament is scrutinized. If it exhibits a bunch of varicose veins, sweep number three should encompass them (Fig. 27). We now cut away down toward the uterine, shoving back the bladder in front and peritoneum behind to bare or nearly bare the artery. The next sweep circles it (Fig. 23) and locks home (Figs. 24 and 28). The vessel is cut. The last sweep of the stitch as a ligature circles the vessels just to the side of the cervix (Fig. 24) and should get some grip in cervical or vaginal tissue for traction purposes.

Now one may with advantage repeat the procedure from the opposite side (Fig. 25). And for this reason. These suture ligatures make convenient cervix tractors, and we may often dispense entirely with other clamps than those used to prevent reflux bleeding. Next the uterus is cut away taking care to come the cervix in such fashion as to leave little or no cervical canal (Fig. 24). The cervix stump swings between two tractors, namely the ligatures. One of these next approximates the two faces of the cervix crater taking care to turn into this raw surface the cut ends of the round ligaments (Fig. 26) and it is then tied to its fellow of the opposite side. Finally the second suture becomes the peritoneal uterine and closes in all raw areas (Fig. 29). At any step in the process one may tie the strands then go on with them. When the cervix is to be removed the same procedure holds good substituting the words vaginal edge for cervix crater.

The same principle is applied to large uterine and ovarian tumors and pus-tubes and to broad ligaments however distorted by a variation in the procedure. Whenever there would be between one artery and the next a gap or space and this would be crossed by a span of suture that could not be drawn taut each artery can be securely grasped without altering the principle of this method.

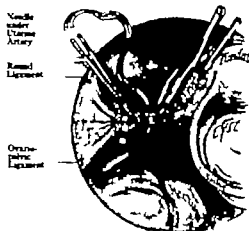


Fig. 23

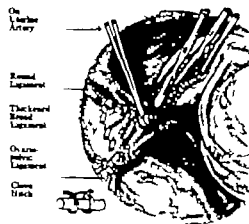


Fig. 24

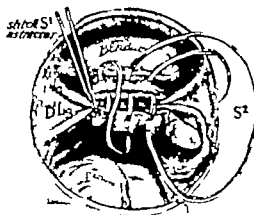


Fig. 25

Figs. 23-25. View int. pel. vis.—stitches drawn large—show closure of broad ligament & each step of ligation, and effective tractor action. Fig. 26 double bite or dove hitch, used when any slack of line of delicate stitching intervenes between ligature action. Fig. 29. Peritoneal protrusion over stump.

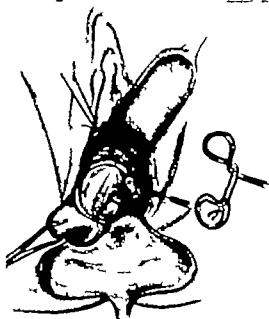


FIG. 29.—The continuous double suture climbs the broad ligament; the second loop, here nestled home,

The vessel is to be caught in one loop and afterward by a second—the second locking the first by the familiar clove hitch (Fig. 28).

Thus between the location of secure ligatures on several vessels, there can be lines or areas of mere suturing, all cared for by the same running strands (Fig. 28). The advantage is not only simplicity and speed but also this—one does away with the curious and general practice of laying open wide raw spaces of connective tissue and then covering them in later. By coapting before cutting—or immediately on cutting—one closes the denuded areas, as it were before creating them.

Vaginal Hysterectomy. The drawbacks to the lower route have been slowness and fussiness; occasional slipping of ligatures oozing from broad ligament bases that spread wide open and retract into the bloody dark, and wide raw areas left uncovered by peritoneum.

If by means of a long suture-ligature-tractor for each side—of fine, plain catgut doubled—one sweeps about the vessels while



circles uterine artery (U.A.). Second cut of ligament has been made. Tractor action shown. Fig. 30—A small fundus may be extracted, then round ligament, then tube and ovary—each grasped by lock stitch. Or uterus may first be bisected. Or, on upper section of broad ligament, lock stitch may follow clamp and cut.

he closes together and climbs and pulls down broad ligament all by steps in the same process then cuts the uterus out thereafter with one of the same stitches sews the ligament masses together closes the peritoneum of the cul-de-sac, and cares for the posterior vaginal gap with the other unites the anterior peritoneum, anchors the bladder and cares for the longitudinal vaginal incision, all by running continuous suture—he has, by a succession of well-reasoned movements, planned for the four requisites. The steps are as follows:

After the bladder is pushed back and the cul-de-sac opened and the base of broad ligament seized cervix and stitch are pulled in different directions and a cut made between. This, or a second loop and cut takes us close to the uterine artery. This sweep bites into tissue to anchor it and then circles the artery is looped and carefully nestled home and kept taut by the assistant (Fig. 30). Rarely a second, or locking loop is applied. Next, the opposite side is treated in the same way. Now the uterus comes down so that the anterior

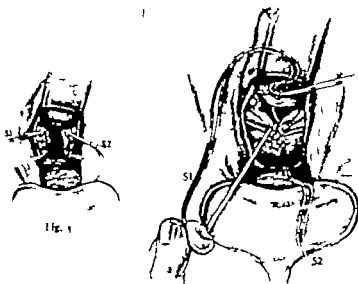


Fig. 31



Fig. 34

Figs. 31, 32, 34. Quilted broad ligament ready to be sewed together. After anterior peritoneum is closed (not shown) bladder is sutured to top or rear of this strong

bridge, Fig. 3. Cul-de-sac slipped over then transverse and longitudinal sigmoid openings approximated catching the vagina up to the ligament also.

peritoneal pouch is accessible for opening and widening. The fundus is drawn out. The suture either takes two more bites round ligament in one (Fig. 31) and tube and ovarian ligament in the other before one side of the uterus is cut free or else a clamp is applied and after the uterus is out these stitches are taken. One must be careful to puncture and grip good tissue to prevent slipping—for example, in the ovarian ligament. The upper end is now tied, shortening the broad ligament. The suture is not cut, however. The opposite side is treated in the same fashion. Care must be taken that in the jump between the ligating loops safe-guarding the lower portion of the broad ligament and those controlling the ovarian and round ligament vessels there be no slack or span. The stitch should now be tied and then continued to sew broad ligaments together make fast the bladder and close the vaginal incisions.

CONCLUSION

If in all other workshops time, study and analysis have resulted in doubling with the same expenditure of energy the output of the worker or cutting in half the time required to do a certain piece of work, then the activities of all concerned in operating room and ward must be subjected to such study. Otherwise the profession is neglecting its plain duty. It now behooves us to call in the expert on scientific management to apply in our business of saving life and health what ever may be transferred from his experience in other fields. Each one of us may help by recording analysis and experiment in his own particular province. In those matters, such as details of operation, of which no outsider could be expected to have sufficient understanding.

Gilbreth, *Primer of Scientific Management*, 1909.

PRELIMINARY REPORT OF EXPERIMENTAL WORK IN BONE TRANSPLANTATION¹

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THE question of bone transplantation and regeneration is one that has been before the profession for many years in spite of which fact, no generally accepted opinion exists as to how or from what tissues the new bone is produced.

A brief review of the literature indicates how unsettled our ideas are upon this interesting and important subject.

Barth (1) in the Surgical Congress of 1893 stated that all living transplanted bone died immediately whether with or without periosteum and that it was unimportant whether living or dead bone was used.

Axhausen (2) says: "There can be no doubt that fresh bone tissue planted in a defect dies throughout but that the periosteum remains alive and capable of reproducing bony tissue and it is probable that the bone marrow retains its vitality."

Beattie (3) in his textbook of pathology published in 1909, says: "The periosteum is composed of two layers, the inner being highly vascular and containing numerous osteoblasts. In operations on bone it is important not to injure this osteogenetic layer of the periosteum. The power to form new bone is not, however, limited to the periosteum, but is also exhibited by the tissue in the cancellous spaces and the medullary cavity."

Wieder (4) of the University of Pennsylvania in a study of the healing of fractures in 1907 observed that "the bone-cells are confined and slow to react. They only form bone when liberated. The periosteum is early and free of reaction. The endosteum is most active. Both the periosteum and endosteum produce osteoblasts and osteoclasts."

Janeway (5) in 1909, in mentioning the few who at that time maintained the viability of the bone graft stated that "all others have recognized the death of the implanted bone, its revascularization and penetration by granulation tissue, and through

this means, the production of new haversian canals, the lining of the new vessels with osteoblasts and the deposition of new bone in concentric layers around the newly formed blood vessels." He also recognizes that "these changes are solely dependent upon the living and regenerative powers of the transplanted periosteum and marrow."

John B. Murphy (6) in 1912 in a very complete discussion of the surgery of the bones joints and tendons concludes as follows:

"Bone without its periosteum transplanted into muscle and cellular tissue always dies and is ultimately absorbed. When transplanted as above, with its periosteum it practically always dies except in infants or very young children. If transplanted with or without its periosteum in the same individual and contacted with living osteogenetic bone at one or both ends, it acts as a scaffolding for the reproduction of new bone of the same size and shape as the transplanted fragment. The transplanted fragment, no matter how large or how small, is always ultimately absorbed."

Streissler (7) in an exhaustive review of the subject says that "the best material for transplantation is living periosteum covered human bone preferably from the patient himself. Bone transplanted without periosteum undergoes absorption and therefore should not be used for transplantation. Periosteum can be transplanted by itself and remain alive. It grows bone even when removed 60 hours after death in rabbits. (Bone marrow when transplanted alone has osteogenic powers.)"

The publication of MacEwen's book on the Growth of Bone (8) in 1912 with his many convincing experiments has resulted in a great stimulation to the experimental side of this question. His conclusions briefly stated, are as follows: "The periosteum is not osteogenetic. The osteoblast has independent vitality and proliferative powers

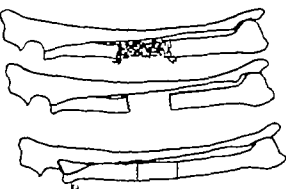


Fig. 1

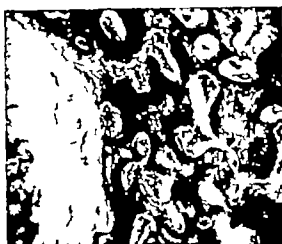


Fig. 2

in the bone and soft tissues. The diaphyseal ends of the epiphyseal cartilages have great inherent reproductive power.

Cotton and Loder (9) in a report of an experimental study of the fate of bone grafts report uniform survival and healing in of graft and microscopically a rapid covering of the graft by new endosteal bone laid down by the activity of the endosteoblasts in all portions of the graft center and periphery.

In contrast with these conclusions, Han (10) in a series of experiments studying the regeneration of bone from periosteum found that in working on the ribs isolation of the rib from its periosteal bed caused atrophy with never any evidence of proliferation nor was any evidence of union found in fractures produced in periosteum free bone. The severed ends of the denuded ribs inserted into the muscles never showed evidence of

regeneration. New bone forming at the angle of separation of the raised rib and periosteum seemed to follow along the periosteum and grow better in blood-clot. He believes that the combined action of the periosteum and blood-clot was responsible for the formation of the new bone.

McWilliams (11) who has been one of the most persistent investigators of this subject from the experimental as well as practical point of view concludes in an article published less than one month ago that living bone grafts have life inherent in themselves and that the theory that contact with living bone is necessary for the subsequent life of grafts must be given up. He goes on to say that

93 per cent of periosteum covered grafts survive while 48 per cent of his bone grafts

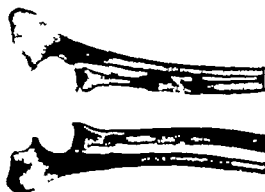


Fig. 3

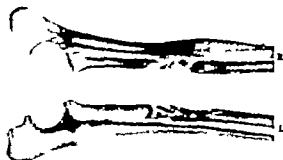


Fig. 4 R right, L, left.



Fig. 5.

without periosteum lived. Also that in a certain number of cases he was able to produce new bone from periosteum transplanted into the soft parts.

The fact that a microscopic examination is necessary to determine whether a transplant has survived or merely grown in makes it impossible except in rare instances to draw conclusions from the many reports of successful bone transplantation in the human.

The contradictory results obtained by careful observers in the work or even by the same observer in a series of experiments can I believe be explained by the variations in one factor namely the amount of blood supply which the transplanted bone obtains. If we can prove that the bone-cells in a transplant can live and grow we have the right to draw an analogy with the knowledge which we possess concerning the rules for skin grafting where we have long agreed that at any rate in autoplasts, the essential factor in obtaining a favorable result is the establishing of a sufficient blood-supply. I see no reason why the physiologic reaction of a bone-cell should in any essential degree differ from that of an epithelial-cell.

We have all known of failures in skin-grafting because the transplant failed to take,¹¹ or in other words to obtain sufficient nourishment for life and growth. The same explanation can I believe, be made to hold good for our results in bone work.

It has been with this idea of blood-supply in mind that I have been working for the past year. The cases cited in this report have been limited almost entirely to the one phase of the problem which I consider essential as a basis for further work namely the study of the cortical bone itself distinct from its periosteum and marrow in an attempt to prove the viability and proliferative powers of the bone-cells which are therein contained.

This work has been done at the Nelson Morris Research Institute and a total of twenty-seven dogs have been operated upon thus far of which reports concerning eight have been included in this paper.

Transplants from the same animal were used and the work was done as far as possible upon young dogs. The usual technique was to resect three to four centimeters of the shaft of the radius or ulna. The resected fragment was then split and the periosteum, endosteum and marrow thoroughly curetted away. In order to obtain the best possible nourishment, the resected bone was then divided into many small fragments averaging three millimeters in diameter and one millimeter in thickness. The opposite leg was used as a control in some of the cases and the same technique followed here except that the bone-cells in the fragments were killed by boiling for five minutes before use.

The many fragments of bone prepared as above were replaced in the cavity left by the original resection. In some cases the adjacent cut ends of the shaft were allowed to remain open, in others the ends were closed by periosteal cuffs or fascia and muscle flaps. After the fragments were replaced the overlying muscles and skin were closed with cat gut and plaster casts were applied for from



Fig. 6.

two to three weeks. The drawing (Fig. 1) shows roughly the general method followed in most of these experiments.

Experiment No. Dog No. Gives the findings nine weeks after operation. In a case where the bone had been prepared as described above and had been replaced in the original cavity the adjacent ends of the shaft being left open. The X-ray (Fig. 2) and the post-mortem examination established the fact that complete bony union of the many small fragments had occurred. The new formed bone was irregular in outline and increased the diameter of the radius about one-half at this point. There appeared to be no interference with the interosseous membrane and pronation and supination was free.

The report of the microscopic examination (Fig. 3) is as follows. The section was removed from the upper end of the irregular mass of bone so as to include a portion of the old bony shaft and the new bone. Live, actively growing new bone was to be seen throughout this section firmly uniting the original transplants to one another and to the end of the shaft. No evidence of growing in from the end of the shaft was observed. Throughout the entire section it was only possible to find one or two of the transplanted fragments which had failed to survive. The rest were all alive and apparently fully engaged in the production of new bone.

Experiment No. Dog No. 4. This dog was posted in five weeks, the fragments having been prepared in the same way as in Experiment No. 3, the difference being that the left leg was used as a control. On the control side the fragments of bone were boiled for five minutes before being replaced. The ends of the shaft were left open on both sides. The examination at post-mortem shows a marked difference between the two sides. On the left side



Fig. 3

where the fragments were boiled before replacing there was complete failure of union, the transplants being freely movable in a loose, connective tissue in which the individual pieces of bone could be felt. On the right side, a fairly good bony union was found to exist. Ossification, of course, was not complete and the new bone could be bent, but the fragments were all united in the mass and the surface of the new bone showed the irregular markings of inclusion of the original fragments in the growth.

The X-ray (Fig. 4) of the two sides bears out these post-mortem findings inasmuch as the separate particles of dead bone on the left side can be readily made out, while the fragments on the right side have grown together in a mass with loss of definition in the outline of the original transplants. In this experiment if the new bone were derived from the adjacent ends of the shaft there should be no difference in the findings of the two sides.

The microscopic report is as follows. The section was taken from the firm mass of callus in the right leg. Throughout this section can be seen the original transplants of bone. Most of these have lost their cellular structure; the center but along their periphery the bone-cells persist and in many areas bone trabeculae consisting of osteoblasts and capillaries can be seen growing out into the granulation tissue or extending to near by transplants uniting the grafts in one bony mass. The area included in the microphotograph (Fig. 5) shows one of the smaller transplants lying free in the granulation tissue. Along its entire periphery the osteoblasts can be seen laying down new bone and along one border a network of bone trabeculae is seen to be growing out. There can be no doubt that this new bone is derived from the original fragments and that the growth is from the cortical bone and is independent of periosteum, endosteum, or marrow.

Experiment No. 5 Dog No. 7. In this case



Fig. 7



Fig. 6.



Fig. 7.

the bone fragments were obtained as described previously the difference in the experiment being that the post-mortem was held twenty-one days after the operation. The X-ray examination (Fig. 6) failed to show that ossification had taken place between the fragments, but it also indicated that there had not been any extensive growth from the adjoining ends of the shaft which had been allowed to remain open. The transplanted particles could be felt in the callus which was extensive but still quite soft. The microscopic specimen was made from tissue removed only twenty-one days after the operation and failed to show the extensive formation of new bone trabeculae that was to be observed in the older sections. Except at the periphery of the grafts, most of the nuclei in the transplants had disappeared, however along the margins of most of the bone-fragments are layers of actively growing new bone (Fig. 7). This same new bone layer can be seen lining the haversian systems and the spaces within the bone substance, probably indicating that on these surfaces the supply of nourishment permitted the bone to survive, whereas in the deeper and more solid portions the cells had perished from lack of nutrition.

Experiment No. 4. Dog No. 13. Examination was made after 35 days. In this case the fragments were prepared as described, but the adjacent cut ends of the shaft were sealed off by flaps of muscle and fascia. There was of course no union other than fibrous between the mass of transplants and the

adjacent bony ends of the shaft. This mass was fairly firm but bony union could not be said to have occurred. The microscopic section was made to include the sealed off portion of the shaft on one side, and the tissue between, containing portions of the transplanted fragments. It shows very best results in the effectiveness of the fascia and muscle-flaps in limiting the growth of the shaft into the open space. Below this limiting connective-tissue mass may be seen a fairly large fragment of transplanted bone (Fig. 8). They have a short distance from one another and have grown together in one mass, the new material being actively growing bone and cartilage. From the appearance of this section there can be no doubt but that the new bone and cartilage tissue are derived from the original transplanted fragments. At other points may be seen small fragments of transplanted bone which have survived and which are serving as centers for new bone formation. In this experiment the sealing off of the cut ends of the shaft has prevented (if a thing were possible) the entrance of osteoclasts into this area. In connection with this experiment I should like to show the X-ray (Fig. 9) of a case where the same technique was used as in Experiment 4, except that boiled bone was used in the sealed-off area on the left side as a control. The X-ray (taken thirty two days after operation) indicates the extensive absorption of the dead bone that has taken place, the amounts of bone used originally on the two sides being approximately the same.

Experiment No. 5. Dog No. 3. This dog was posted nine weeks after the head and about three centimeters of the shaft of one radius had been removed, the articular surface scraped off and the fragment replaced with its original position reversed (Fig. 10). In other words the shaft end of the bone fragment removed was now adjacent to the elbow joint. The periosteum was not removed

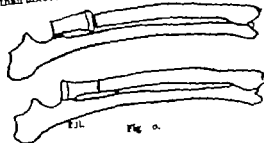


Fig. 9.

Fig. 10.

in this experiment nor was the adjacent end of the shaft sealed. No attempt was made to close the elbow joint. The fascia muscles and skin were closed with catgut and a plaster cast applied for the first three weeks. No complications occurred, and when the dog was observed shortly before post-mortem he appeared to be using both forepaws equally well. On cutting down on the elbow the joint cavity was found to be functioning and to have been restored to normal. A slightly increased amount of joint fluid was present. The end of the transplanted fragment adjacent to the joint had assumed somewhat the contour of the head of a radius and a bed of cartilaginous-like material had formed over it. Moreover the capsule had become continuous with the covering of the transplant, so that, as stated above, there was a complete restoration of the anatomic relations in the joint as well as physiologic function. The distal end of the transplant was found to be firmly associated with the shaft of the radius. There was no evidence of atrophy of the bone. The microscopic report follows. The section was taken from the original transplanted bone and includes both epiphysis and diaphysis, with the epiphyseal line between. All microscopical examination (Fig. 11) establishes beyond any doubt the complete survival of this transplant. The cellular structure of the epiphyseal line can be readily made out and the columnar arrangement of the cartilage cells on the diaphyseal side is retained. The cell-nuclei retain their full staining powers throughout the entire specimen.

I do not think that any one will deny that this transplant lived and was not merely grown into by the adjacent bony shaft. If such had been the case we would certainly not expect the survival of such a definite anatomic structure as an epiphyseal line, or the differences which we recognize in the appearance of epiphyseal and diaphyseal bone. The question of the possibility of transplanting the epiphyseal cartilage, with retention of its function of producing longitudinal growth, is a fascinating one that deserves careful investigation.

Incidental to this work I wish to report an observation of a case where a portion of bony shaft 3 centimeters in length was removed and the adjacent periosteum of the ends of the shaft thoroughly scraped away. The interval between the ends was then surrounded by a transplant of fascia which was made to extend up and down along the shaft for some distance. At the post-mortem nine weeks later complete bony filling in of the space with excessive callus formation had

occurred. The fascia transplant had fused above and below with the periosteum and could not be differentiated from it.

In another experiment (Dog No. 13) the same method was followed except that no fascia transplant was used the space between the ends of the shaft being allowed to fill with blood-clot. In this case no periosteal or bony bridge was allowed to remain, in spite of which fact, at post-mortem nine weeks later a good bony filling in of the space was found to have occurred.

I wish to submit the following conclusions based on the experiments reported on:

1. That cortical bone free of its periosteum endosteum, and marrow will retain its vitality and proliferative powers when subdivided into small fragments and replaced in the tissues. Also that contact with living bone is unnecessary for the growth of these transplants.

2. That larger pieces of bone may be transplanted and remain alive—not being merely grown into by the bone in which they come in contact.

3. That bones may unite after fracture or a space fill in after resection without the aid of any periosteal or bony bridge and that transplanted fascia may be made to take up the nutritional and limiting functions of the periosteum.

The matter of the survival of a transplanted epiphyseal cartilage cannot be said to have been proven but suggests the value of additional careful experiment.

I wish to extend my thanks to Dr. J. W. Jobling and Dr. D. N. Eisendrath for many helpful suggestions and to Dr. H. G. Wells for looking over the microscopic slides. Also to the internes of Michael Reese Hospital for assistance at the operations.

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THE TRANSPLANTATION OF BONE IN POTT'S DISEASE¹

EXHIBITION OF CASES OPERATED BY ALBEE'S METHOD

BY EDWIN W. RYERSON, M. D. CHICAGO

I HAVE no evidence to bear out any of the various theories which Dr. Lewis has advanced many of which are familiar to me. It is difficult to believe in view of the experience which I have had in thirty cases of bone transplantation that the bone dies. If it dies it does remarkably good work after it is dead. It is hard for me to comprehend the actual death of the bone because in cases of death the bone should lose its function but in the cases which I am about to discuss the bone does perform the function which we most desire it to perform.

I have in thirty cases resorted to bone transplantation twenty-eight of these were for Pott's disease. In which the operation of Albee was performed. Albee himself operated in my clinic four of them, at which I assisted and the other twenty four were done by me. Two years ago in December the first three operations of this kind were done in my clinic and two of the cases done at that time are here to-night.

In November 1911 this boy had a large alar kyphosis in his upper thoracic region. He was in bad condition he seemed to be a bad surgical risk. He was growing on so rapidly however that we were glad to accept the risk, and I accordingly performed Albee operation January 1912. Two other boys had been operated by me, both in November 1911. Apparently good results. The technique of the operation is well known so there is no need to go into it.

In the first three cases I mentioned the bone graft were cut out with chisel and mallet a method vastly inferior to the motor saw. The bone-splint in these first cases was small it was light. It was bent around the large kyphosis which you see here. A couple of months the boy was allowed to be up and about without plaster jacket because the disease was so high up that the plaster jacket would do him no good. The symptoms of tuberculosis of the spine had disappeared at the time he began to walk around that is, he no longer had pain, he no longer had disability, he no longer had rigidity of the muscles up and down the spine—the erector muscles. I had not seen him for long time and his deformity seems to have increased slightly but that is partly due to the conspicuous

curves which have increased below and above the seat of deformity. I cannot distinctly feel the bone splint. We have no X-rays of these two cases.

In my second case, the little boy's kyphosis is slightly evident. This was the apex of it. As he bends, the peak of his kyphosis bows up, but he has no difficulty in doing it. He is in good condition and there is every evidence that he is entirely cured. This boy was operated more than two years ago, November 3, 1911. The first boy is still quite pale and weak. His result does not seem to be quite as brilliant as the others. He also has tuberculosis of the hip-joint which has probably delayed his recovery. The second boy is a remarkably good result. The third case operated on over two years ago seems perfectly well although the site of his kyphosis was not diminished by operation.

CASE 4. A young lad who was operated after the results of the original three cases were seen to be satisfactory. In December 1911 that is, about fourteen months ago, she was operated at St. Luke's Hospital during a meeting of the Central States Orthopedic Association.

I had treated her for one year previous to the operation. It was difficult to keep her quiet enough she was getting worse. She was operated upon a year before at the Michael Reese Hospital by one of the surgeons there for appendicitis. She had recovered from that, and at the time I decided that an operation was necessary she had developed an enormous psoas abscess. The abscess was aspirated at St. Luke's Hospital and a pint of pus removed. Not all of the pus was removed, but I could readily remove with the aspirator and two weeks later the aspiration hole having healed, she was operated by the Albee method. We put in a large splint cut with the motor saw. Here is the apex of the deformity. I made no attempt to remove the projecting spinous process. She has been well since three months after operation, and almost immediately after operation the severe girdle pains disappeared. She has since gained in weight and is apparently perfect normal. Bending makes the apex of the knuckle rise up a little bit, but the bone splint, which is at first not securely anchored at the top, has solidified within the last six months. She feels eat without corsets but seems to be doing very well. The bone has entirely disappeared.

CASE 5. The boy exhibited had complete paraplegia, so that he was unable to move his legs at all. Six years ago I began to treat his boy for Pott's disease in the orthopedic clinic. He had at Rush Medical College. He went from bad to worse because extremely emaciated. At the age

nothing but skeleton. Then he developed paraplegia and seemed as hopeless a case as I have ever seen. With the consent of the parents we put in strong Albee splint, scored underneath so it would bend more readily and within two weeks the paraplegia improved, and within a couple of months he was walking round the ward. He had the same condition of hyposteosis that he had when I operated on him. We did not succeed in straightening him, but he has made a gratifying recovery.

CASE 6. The next patient, boy was treated for two years at the Children's Memorial Hospital by extension and rest upon a Bradford frame, and he grew worse. Every time we got him up in a plaster jacket he began to go down hill again, and it was at last decided to do the Albee operation. He had sharp knuckle at the time the operation was done, and I did not succeed in straightening it as much as we have been able to do in some cases. But he has improved rapidly and has gained in weight.

CASE 7. Another boy treated by me for two years for Pott's disease had several sinuses, some on the thigh, and one in the groin. He was operated upon about six or eight months ago and has been running around the wards without apparently any signs of a sensitive spine.

CASE 8. Was operated three months ago, and to-day he had his cast removed. One stitch came out at this point, but otherwise the wound healed uneventfully; the back has become much straighter than it was although the cast was only removed this afternoon.

CASE 9. This case, girl, had a severe psoas contraction from a psoas abscess, the disease being in the lumbar region. The bone-splint had to be inserted into the two upper sacral spinous processes as well as in the lumbar. The splint did not attach itself firmly at first, and apparently is not set in as deeply as it should be, but it does not separate either at top or bottom as she bends over and she says that her back feels perfectly strong and well. She was operated on March 7, 1913.

CASE 10. Was a girl who had large angular deformity which was operated upon the thirteenth of November 1913. She has tuberculous left elbow besides the trouble in the spine. The result is very good.

CASE 11. This boy who was operated last December, seems to have a pretty straight back. He had had sinuses on the side which has closed and he seems to be free from symptoms.

CASE 12. Here was a severe case operated by Dr. Albee at my clinic. She was one of the cases treated I think for three or four years with a rapidly progressing deformity which was more severe at the time operated on than now. Her back has straightened up to some extent. She had splint put in four or five inches long and she has done remarkably well.

CASE 13. Here is another case which shows a good result. This was a sharp projecting knuckle like the knuckle of a bent forefinger and it was possible to straighten it up considerably.

A number of these children have been definitely straightened and some have not. We took a series of X-ray pictures of the large girl's back at different times. They show in the negative better than in the print and demonstrate that the bone-splint is spliced in there solidly although the union at the upper end is not clearly shown.

These cases with the exception of the large girl, all came from my clinic at the Home for Destitute Crippled Children no attempt being made to bring those from the Polyclinic and the Children's Memorial Hospital.

In my opinion Albee's operation is a very important addition to the treatment of Pott's disease. Practically every case can be benefited by it, for a great many of the cases apparently cured by conservative mechanical treatment are later seen to relapse. The operation certainly gives rapid relief to the subjective symptoms in all successful cases and while we cannot believe that the actual tuberculosis disappears as rapidly as do its symptoms, we can nevertheless be sure that it will disappear more rapidly in those cases where more perfect fixation of the diseased portion of the spine is obtained. The operation of Russell A. Hibbs is essentially as sound in principle as that of Albee but I have so far had no experience with it.

BONE TRANSPLANT¹

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FOR many years efforts have been repeatedly made to improve upon the method of mechanical aid which is used in the correction and treatment of certain types of deformity, the predominating inclination being to get support under the skin. Prof. Lange² of Munich four years ago at Washington called attention to the classic work of Carrel who opened the prospect of supplying diseased or lost parts of the body by transplantation of parts of other men. Twelve years ago Lange was hard at work on the problem of tuberculous spondylitis, trying to devise some means of giving support to the spine and relieving the pressure from the vertebral body by means other than recumbency, cast, or visible brace, and in 1910, in an article entitled "Support for the Spondylitic Spine by Means of Buried Steel Bars Attached to the Vertebrae," made a plea for what he called heteroplastic. He asserted we should further develop it because we always have inorganic material at hand in any quantity as a substance. At this time he reported a case of tuberculous spondylitis treated with the insertion of two steel wires in plated which were placed along either side of the spinous processes. This idea of a metal support beneath the skin is not indeed successful, but is interesting as the forerunner of the bone support, which must now be regarded as successful.

The development of under-the-skin bone support by Albee in tuberculous spondylitis in New York and its successful repetition in Chicago and elsewhere is so gratifying in selected cases of this disease and of fractured vertebrae as to make it a popular treatment growing in favor and tending to replace other methods of operative support for these deformities.

A few of the additional possibilities of the bone transplant are

- 1 To plate fractures in long bones, thereby

diminishing the possibility of suppuration and of a second operation, in comparison with the Lane plate

- 2 To supply congenital deficiency in long bones.

- 3 To retain corrected or near-corrected position in scoliotic spines.

- 4 To replace resected tuberculous joints.

- 5 To hold the over-corrected talipes equino varus foot in position by placing a wedge of bone taken from the tibia in the groove made by the over-correction and in hip pegging, as suggested by Albee

- 6 To supply loss of bone following osteomyelitis

- 7 To replace joints resected for cyst or malignancy using strips of tibia taken from the same patient, as in A. E. Halstead's shoulder case not yet reported. At this time I will consider only cases covered by headings 1 to 4.

1 Fractures in long bones and bone transplant. As suggested above the use of metal in general is unsatisfactory. This method as represented by the Lane plate seems from careful study of the statistics of a number of cases to be used frequently when simple methods should suffice and when used it is more or less inclined to aid the tendency toward suppuration. In about forty-eight per cent of one series of cases studied there was suppuration or a second operation required to remove the plates. The suppuration is to my mind caused by the Lane plate, and by nothing else. The Lane technique is known to be superlatively careful, and it must therefore, be the irritation from the Lane plate which causes the trouble. In coming to this conclusion I have had in mind that in my orthopedic services involving a considerable amount of open operative work on the long bones of children and adults, in operations on congenital and rachitic deformities, before and after complete debridement and on old ununited and malunited fractures, I have had practically no suppura-

Lange, Am. J. Orth. Surg. vol. 34

Lange, Am. J. Orth. Surg. vol.

tion. In a series of thirty four transplants removed from the tibia some of them ten inches long, there was no infection there was however slight infection in the wound where the transplant was placed in four of the cases. In one of these the trouble was believed to be caused by the heavy silk used to anchor the transplant one was a stitch abscess which readily healed, and the other two gave evidence of being in the soft tissue, nearer the skin than the transplant. In none of these cases have the transplants been removed or been in such a condition as to indicate removal. A number of very extreme anterior bows of the tibia were openly worked on, often with marked trauma to surrounding parts, and handled with several sets of hands also wedges of bone and strips of bone were cut away from the crest of the tibia for aesthetic effect only. In none of these cases here referred to in which there was so much handling of the bone, was a second operation or anesthetic necessary as was the case in the series of cases before referred to, in which the Lane plate was placed. The Lane plate, and it alone makes the Lane technique necessary and this most careful technique, as shown by the results, seems to indicate the substitution of some other method where possible.

One case presented itself in which I had the opportunity to use a bone plate precisely as a Lane plate is used. I am not at liberty to report on this case in detail, as it is soon to be published, but I may say that the result was satisfactory and justifies a careful study of the application of the bone-plate in selected cases of fractures, if plates are necessary instead of plating with foreign material.

2 *Congenital deficiency in long bones and bone transplant* Cases having a congenital absence of some part of a long bone lend themselves most favorably to bone transplant, and those where the entire bone is absent should be considered as possible subjects for benefits from this kind of surgery. As illustrative of congenital total absence of a bone, as far as roentgen ray aids gives evidence is a child two years old, in whom the fifth metacarpal bone of the right hand was absent the little finger and its phalanges were

however present. Fair motion in the little finger discouraged its sacrifice by amputation. The possibility of bone transplant was now considered. In a child two and one quarter years old Rotch by roentgen ray shows the os magnum, unciform, lower epiphysis of the radius, cuniform and semilunar present. The proximal epiphysis of the first phalanx of the little finger is faintly present distal and proximal epiphyses of the fifth metacarpal are also faintly present. In the case here mentioned, there was total absence at two years of the fifth metacarpal, and no shadow of the distal or proximal epiphysis was present. There was present however the proximal epiphysis of the first phalanx of the fifth finger and the unciform bone. There was no attachment for the proposed bone transplant which was intended to replace the fifth metacarpal. The transplant, however was placed for the following reasons

(a) Although the roentgen ray picture showed no distal and no proximal epiphyses of the fifth metacarpal bone, normally they should be there but would give no shadow at two years of age

(b) If they were congenitally absent, the proximal epiphyses of the first phalanx of the fifth metacarpal and unciform bones which were present were the goals for contacting the ends of the transplant.

(c) It was either amputation or a trial at bone transplant. This case was operated a week ago

3 *Retention of position in scoliotic spines and bone transplants* The retention of the scoliotic spine in a corrected or over-corrected position is a problem which many who are vexed with the question of the treatment of these cases are concerned. Some think that probably the bone transplant along the spinal column into the spinous processes, as is done for the support of the tuberculous spine, would prove successful. The difficulties which present themselves in this work are

(a) The correction of the curve in the severe cases, into a position for the transplant. In the mild, flexible cases such satisfactory results are obtained by corrective corsets and exercises that operative fixation is needless.

(b) Even when partially corrected (and this is probably all one may confidently expect in the stiff cases) the spinous processes of the rotated vertebrae are not, as in Pott's cases, lined up evenly but the entire vertebrae are bent to the side, and each spinous process twisted out of line in such a manner as to make the placing of the transplant between the split surfaces of the posterior spines extremely difficult. Yet animal experimentation encourages more work along this line with hope of better results from operative methods than those obtained by Hoke¹ or Le Breton. The latter made sections of some of the ribs close to the spine, and of a part of the erector spinal group in the apex of the curve, and division of several of the ligaments but with doubtful results.

4. *Replacing resected tuberculous joints with bone transplant* Replacement of resected tuberculous joints with bone taken from the patient's tibia often becomes a procedure forced upon the operator with only one alternative amputation of the limb. Experience shows that in resection of the knee-joint, for instance the case is often too far advanced, the bone of the femur and of the tibia too extensively destroyed to allow apposition of healthy firm bone with a fair possibility of ankylosis strong enough to give substantial support. Frequently several inches of both the femur and the tibia must be resected before the tuberculous material is thoroughly cleansed away and many cases present themselves for treatment so late in the disease that the eradication of tuberculous material without amputation is never accomplished. Stiles found that between 190 and 1911 in the Royal Edinburgh Hospital for sick children there were sixty-three excisions of the knee in which twelve required subsequent amputation. Without opening up the question of earlier operative interference in selected cases of tuberculous joints, it seems only fair to call attention to the large number of neglected cases complicated with extensive involvement of the para-articular tissue

amalgam disease, and advanced anemia, with three possibilities. (a) Resection with doubtful results. (b) Resection with transplant. (c) Death from complications.

The literature gives an account of a case in which Streibler transplanted two sections of bone to take the place of a knee-joint resected for tuberculosis. The case was one in which it was possible to cut away all the affected bone. There seems to be no case reported in which the transplant was placed in tuberculous material. As an example of a knee transplant in which the object was

(1) To eradicate the disease if possible without amputation, and place the transplant in sound bone but, (2) if impossible, to clean away all the diseased bone, then to transplant in the diseased bone attempting to give a stiff leg, strong enough to bear the weight of the body thus preventing amputation.

I report the following case

A girl 6 years old, Austrian by birth, had been an invalid for four years, suffering pain and inability to go to work or school on account of tuberculosis left knee. She was neglected case, and her only chance for comfort and working ability lay in extreme operative interference. E. Wyllis Andrews advised against amputation but, however, agreed to resection, which was done, removing about three inches of the femur and about two inches of the tibia. The involvement however was so extensive that eradication of all the tuberculous material was impossible without amputation. This I refused to do for two reasons. First, the condition of the patient was now not favorable. Second, the prospect for transplanting later was promising for good stiff leg instead of an artificial one. The wound, therefore, was closed, extension was applied, while cast was placed to give proper support and maintain extension. This resection gave the patient great relief and her general condition began to improve. Three months after the resection, when her blood had improved, second operation was performed, transplanting large piece of the tibia from the opposite leg and implanting it so as to span the space between the tibia and the femur and firmly fixing it to these bones and to the patella.

The technique was as follows

A longitudinal incision, fourteen inches long, was made in the midline of the anterior surface of the left thigh and leg, above and below the knee. The patellar ligaments were cut at the outer side and below and the patella pulled to the inner side. The incision was carried down to the surface of the tibia and the femur. Two inches of the upper end of the

¹Stiles, Tr. Am. Orth. Assn., 1904, 109.

²Le Breton, Am. J. Orth. Surg., 1907, 17, 25.

³Stiles, Harold B. *After Results of Major Operations for Tuberculous Diseases of Joints*. Brit. M. J., 1911, 361.

⁴Streubler, Chir. Klin. (Ber.), 1904, 100, 12.

tibia were sawed off leaving a fairly healthy tibial surface. A wedge-shaped piece of the anterior surface of the tibia, one inch long, was now chiseled out to permit the graft, ten inches long taken from the right tibia, to fit in and lock. A wedge-shaped piece of the lower end of the femur was also removed and some newly-formed bony tissue chiseled out to receive the upper end of the graft, but the bone here was soft, tuberculous and unpromising for transplant bed. Transverse drill holes were now made in one side of the lower end of the femur in the upper end of the tibia, and through the ends of the graft to correspond. The bone graft was now fitted in place between the femur and the tibia and fixed by kangaroo tendon through the drill holes made in the femur patella, and the tibia. All periosteum which was saved was sutured about the bone. The muscles were sutured together over the graft with catgut and the wound closed with silkworm sutures and dressed with dry gauze, pads, and sterile bandage. A plaster of Paris cast was now applied from the thigh to the toes.

For the removal of the transplant from the tibia a longitudinal incision was made over the crest of the right tibia, twelve inches long, down to the bone. For this part of the operation fresh set of instruments was used. The muscles were separated from the bone at its outer surface and triangular graft from the crest of the tibia, ten inches long, was removed with its periosteum and the muscles were pulled over the denuded bone with catgut sutures, and the wound closed with silkworm. A plaster of Paris cast was applied from the knee down, enclosing the foot.

The progress of this case since the transplant was placed has been satisfactory. The patient improved in general condition. The wound healed by first intention, but later gave evidence of slight discharge of serum, containing few polymorphous leucocytes and some scattered cocci. This soon cleared up and both wounds are closed and look resistant and healthy. The patient is up and about with crutches, forbidden, however to bear weight on the leg. Röntgen ray pictures show the bed in the right tibia from which the transplant was taken is fast filling in, as is the case in a series of twenty-seven legs from which large grafts were taken for tuberculous spines, as reported in paper entitled, "Spinal Transplant," read last month before the Chicago Medical Society.

The pictures of the transplant, placed with

its upper end in the remains of a tuberculous femur one side of which was too soft to hold a drill hole and the lower end also lying in tuberculous material show regeneration of bone taking place with the lower end of the transplant well interlocked with the tibia and the upper end in good condition but somewhat atrophied. This bone support looks better at this time six months after the operation, than I had anticipated in view of the decayed condition of the femur at the time of the operation.

An interpretation by Adolph Hartung, of the Röntgen ray lantern slide, is as follows:

The anteroposterior view of the plate shows an absent area about the knee joint at the lower portion of the femur and the upper part of the tibia. Extending between the ends of these two bones and into their medullary canal for a distance of about one inch is a splint having the consistency of solid bone and tapering somewhat at its upper end. Around this upper end some rarefaction has occurred in the femur uniform on its outer but irregular on its inner aspect. Well defined calcareous deposits extend from the margins of the resected femur and tibia. Along the lower end of the splint they seem to encircle it fairly uniformly up to the head of the fibula. The fibula is entirely intact and normal in appearance. The patella is indistinctly outlined and apparently covered by overlying shadows of calcareous material of which there is a good deal to be seen throughout the joint area.

The lateral view shows much the same picture except that here the patella seems intact and directly in contact with the bone splint. The upper end of the splint is very near the anterior aspect of the femur. Considerable calcareous deposit is seen behind the splint and also around its lower end.

SUPERNUMERARY URETER OPENING EXTRAVESICALLY

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SUPERNUMERARY ureters emptying into the bladder are often seen, but a supernumerary ureter opening extravesically is a rarity and because of this, its clinical importance and the fact that there is generally a failure to properly diagnose the condition I report my case.

N. M., a girl of twenty years, referred by Dr. A. R. Stern. Her menstrual history was negative, and she had never been pregnant. As long as she can remember she had been wet with urine, day and night, and yet voids normally once or twice a day. Neither exertion nor rest has any effect upon this condition. The patient is well formed, shows no stigmata of degeneration nor abnormalities of the genital organs.

The condition was suspected from her history, which was characteristic; i. e. constant discharge of urine since birth in addition to normal voiding.

The examination was made with the idea of finding an abnormally opening ureter and was conducted as follows:

Ten cc. of three tenths of one per cent solution of indigo-carmin was injected intra-venously and the patient then cystoscoped. A normally situated ureter excreting urine in a normal manner was found on either side no vesical lesions nor malformations were noted in the external orifice of the urethra. The whole urethra (with the Kelly speculum) and the entire vagina, with the patient in the knee breast posture was then inspected without discovering the source of the leakage.

Still being convinced that the condition was as at first suspected I plugged the vagina with wet cotton tampons, put wet cotton applicators in the urethra extending just to the vesical sphincter of the urethra, and a pledget of wet cotton over the vestibule of the vagina. After waiting fifteen minutes these were removed, and it was found that the cotton over the urethral orifice was stained faintly blue while the ones from the urethra and vagina showed no discoloration.

Close inspection failed to show the ureter until the patient strained in moving when there was a discharge of a few drops of fluid from a minute orifice in the median line just

at the lower edge of the urethral opening. A No. 6 ureteral catheter could be introduced only two inches, running slightly to the left. From this was obtained in ten minutes 511 of a faintly bluish colored fluid of a low specific gravity. The specific gravity was not taken, nor was an estimate of the urea percentage made.

It would have been interesting to have injected all three ureters with collargol and to have radiographed the patient to see their relations to each other and to the kidney pelves, but this was abstained from, as it would have been of no benefit to the patient, and we ran the danger of causing infection, ureters opening extravesically being especially susceptible.

Operations. On June 28, 1913, in the Post Graduate Hospital, under ether anesthesia, the supernumerary ureter was catheterized for four inches with a ureteral catheter. Using this as a guide, an incision was made over it on the under surface of the urethra, but unfortunately the incision went into the ureter itself, which was thin-walled and dilated to the size of a large lead pencil. This dilatation involved only the distal one inch of the ureter. Thinking that the whole ureter would possibly be dilated and that I would have great difficulty in dissecting it out, I then put through the urethra a uterine sound which was made to bulge the bladder just over this ureteral sac. An opening between this sac and the bladder was made, and the mucosa of the ureteral sac and the mucosa of the bladder sutured together. Next the floor of the ureteral sac and the external orifice of the ureter were closed with fine catgut, thus producing a fistula between the bladder and the ureteral sac into which the ureter emptied.

The vagina was closed over this with sutures of silk-worm gut. A retention catheter was put into the bladder and removed on the fourth day; up to this time there had been no leakage, but following the removal of the catheter the patient had the same leakage as before the operation.

Because of this failure the patient was operated upon again on July 11th. The silk worm gut sutures were removed and it was found that the leakage occurred from the posterior end of the incision. To gain better access to the ureter a pararectal incision was made through the left sulcus of the vagina. A catheter was then passed into the ureter and the ureter dissected out for an inch and a half. I was surprised to find how easily this was done and to see how thick the ureter really was, being here the size of a goose quill. A uterine sound was then passed through the urethra and made to bulge the bladder just behind and to the inner side of the normal opening of the left ureter. A small incision was made on the point of the sound which was then pushed into the vagina. A suture was passed through one lip of the ureter tied to the sound, and in this way the ureter was pulled into the bladder for a distance of three quarters of an inch. This suture was withdrawn through the urethra and with a needle was anchored just outside of the clitoris. One fine suture of plain catgut was passed through a portion of the muscular wall of the ureter and the opening into the bladder and the vagina closed over this with interrupted sutures of catgut. A retention catheter was put into the bladder for four days.

Following this operation there was not a bit of leakage, but the patient experienced frequent and painful urination due to a rather severe cystitis, which lasted ten days, but was cleared up by irrigations with nitrate of silver solution.

Two days following the second operation the patient had a rise of temperature and pain in the region of the left kidney. The temperature quickly subsided, but since then there has been more or less pain in the renal region.

An examination on August 1st with the cystoscope shows the ureter that was implanted as a small round opening just behind and to the inner side of, the normal ureter. I have been unable to catheterize this on account of its minuteness and after an intravenous injection of indigo-carmin I have seen no elimination of the dye from it. There seems to be a periodical discharge of small amounts of clear fluid though of this I am not certain.

In most of the reported cases as in mine the following conditions were noted

Minute orifices. In ureters opening just below the urethra this has been described by all except Olshausen as a very minute round orifice and generally the location has been just on the margin of the external orifice of the urethra.

In Olshausen's case this orifice was described as slit-formed. These orifices are very difficult to discover even when directly under the eye and are best seen after giving the patient methylene-blue or indigo-carmin to render the urine blue.

Sac formation. In most of the cases this has been noted just back of the contracted orifice but this as a rule involves only the terminal portion of the ureter. The difficulty in catheterization is due to the trouble in making the catheter enter the ureter at the kidney end of the sac.

Impaired function. This is most probably due to the back pressure atrophy caused by the contracted orifice of the ureter. This has been noted in most of the cases as evidenced by the light color low specific gravity of urine with small urea content, and deficient elimination of phenolsulphonaphthalein and indigo-carmin.

Tendency to Complications. This is noted in many cases of supernumerary ureter and when they open extravasically it is increased. Infection after instrumentation because of the poor drainage due to the contracted orifice is the most usual complication. Cessation of function was apparent in my case but not noted in those reported by the authorities mentioned below. This cessation probably came from the contraction of the vesical orifice of the ureter.

Diagnosis. From the history of incontinence since birth with normal voiding of urine, an abnormal opening of the ureter should be suspected.

If by inspection the orifice of the ureter is not seen indigo-carmin methylene blue or phenolsulphonaphthalein should be given, and the vagina and vulva packed with cotton. If phenolsulphonaphthalein is used the cotton should be wet with an alkaline solution to bring out the color after fifteen to twenty

minutes the cotton is removed and the stained portion will give a clue to the point of the opening of the ureter

Cystoscopy will show whether the extra vesical ureter is supernumerary or the only one from the kidney

Many operations have been proposed for this condition such as ligation of the ureter establishment of a fistula between the sac-like portion of the ureter and bladder implantation of the ureter into the bladder either through the vagina or abdominally both intra and extra-peritoneally partial nephrectomy removing the portion of the kidney drained by the supernumerary ureter

From a study of my case and those reported in the literature, I believe the vaginal implantation the procedure of choice.

To determine just how this should be best done, I shall in the future attempt to catheterize the two ureters on the side affected with different kinds of X ray bougies and have stereoradiographs made. By determining the relation of one to the other the operation can be so planned that they will not be twisted around each other

For those desiring to review the literature of the subject, I refer them to

Adrian & A. V. Lichtenberg, *Zschr. f. Urol. Chir.* 9, 3, I, Nos. 4 and 5. Die Klinische Bedeutung der Missbildungen der Niere des Nierenbeckens und Harnleiters

Joh. Hartman of Leipzig, reports from the literature:

Sixteen certain cases of supernumerary extra vesical ureters, twelve uncertain cases of supernumerary extravascular ureters and seven cases of single ureter opening extravascularly

J. P. Hartman, of Copenhagen, reports thirteen cases of supernumerary ureters opening extravascularly operated upon by various surgeons after the following methods

	No.	Supernumerary	Unicystic
Ligation		0	
Ureterocystostomy			
Intravesical			
Vaginal	5	0	5
Implantation			
Laparotomy	3		1
Abdominal extraperitoneal		1	0
Vaginal	6	4	
Resection of Kidney			0
	0	10	0

He also gives the following analysis of thirty seven cases of ureter opening extravascularly fourteen of which are supernumerary ureters

Opening in the	No.	Single ureter	Supernumerary
Urethra	6	3	3
Vagina	8	5	3
Vestibule			8 (3?)
Gartner's Duct	2	?	?

Kocher f. Urol. 1912, vol. 429. Zur Anatomie und Operation der angeborenen Nierenmissbildungen

Kocher f. Gynäk. Urol. 1912, vol. 429.

THE INFLUENCE OF ECTOPIC PREGNANCY ON THE UTERUS WITH SPECIAL REFERENCE TO CHANGES IN ITS BLOOD SUPPLY AND UTERINE BLEEDING¹

BASED ON THE STUDY OF 25 INJECTED UTERI ASSOCIATED WITH ECTOPIC PREGNANCY

BY JOHN A. SAMPSON M.D. ALBANY N. Y.

THE purpose of the present article is to show the influence of ectopic pregnancy on the uterus, with special reference to the changes in its blood supply and the etiology of the uterine bleeding due to this condition. The latter is an important symptom which is usually present in these cases when the physician is first called to see the patient.

The material for this study consisted of twenty-five uteri associated with ectopic pregnancy which were removed at operation, and as a matter of routine injected soon afterwards.

Dr Richard R. Smith, in 1911 presented before the American Gynecological Society a paper entitled "Repeated Ectopic Pregnancy with a Report of Four Cases and a Statistical Review of the Literature." He concludes that "normal pregnancies following ectopic pregnancy are not as frequent as one might hopefully suggest, and that the practical lesson to be drawn from this discussion of repeated ectopics relates to the disposition of the opposite tube at the time of the operation. The strong tendency of the last decade toward conservation of the pelvic organs has resulted in the saving of the opposite tube with most surgeons unless it is diseased. Is this conservation based on logical grounds? It is my opinion that we must modify it. The common basis for decision has been the condition of the tube under judgment, and a little thought will show this to be unreliable. In very many of the reports in which its condition is mentioned it is spoken of as normal. It must be frankly acknowledged that we are unable to judge of the capabilities of a tube from its appearance. Shall we not rather consider the woman's condition relative to age, previ-

ous child bearings her health, her wishes, and the danger lurking in the tube that is left whatever its appearance. I would suggest that the matter of future possibilities be freely discussed so far as practicable with each patient before the abdomen is opened and would suggest the following outline of procedure

1 If a woman has had no children and is young or being older is desirous of having children we should conserve the opposite tube unless it is hopelessly closed. We do this deliberately with the full knowledge that further pregnancies may not occur and that she may have in spite of the normal appearance of the tube, a further ectopic.

2 In women who have borne children, we may be governed by her desire to have more and may leave it unless it is absolutely closed.

3 In women who have had children and have borne as many as they desire, we should unhesitatingly remove the opposite tube and preclude the possibility of further accident, whether the tube appears normal or not.

By following this course we should at least have a good excuse for submitting a woman to the distressing possibility of a second ectopic pregnancy.

For the last four years I have been following a procedure similar to the one outlined by Smith and my own experience has justified this procedure. Previous to 1903 I had operated upon eleven cases of ectopic pregnancy in the service of Dr Howard A. Kelly of Baltimore, and know nothing of the future of these cases, but in only five was a subsequent pregnancy possible, both tubes or the uterus and tubes having been removed in the other six.

Since coming to Albany in 1905, I have operated upon forty cases of ectopic preg-

nancy. In only eleven was a future pregnancy possible the uterus having been removed in twenty-six, and future conception made impossible by the removal of both tubes in one the only remaining tube in another and one having died soon after the operation. The subsequent history of these eleven patients is of interest, especially as the opposite tube was carefully examined in nine of them and was apparently normal and was saved with the hope of subsequent uterine pregnancy. In two the condition of the patients was so grave at the time of the operation that the opposite tube was not examined. Five of the eleven patients have not conceived since the operation (less than six months has elapsed since the operation in two of them). Of the other six patients two have borne children one has had two children since her operation and another has had one the latter has subsequently had a tubal pregnancy in the remaining tube. Three have had miscarriages, one has had four and two have had one each. The sixth has had a tubal pregnancy in the opposite tube. Therefore, two of the six have had a tubal pregnancy in the opposite tube one as already stated, was preceded by a uterine pregnancy. In addition I have encountered two other cases of tubal pregnancy in which the opposite tube had been removed for a similar condition by another surgeon.

My own experience conclusively proves that when we do not remove the opposite tube, even though it appears normal, when operating for tubal pregnancy the patient may subsequently have a pregnancy in that tube.

In spite of the dangers of repeated ectopic pregnancy I believe that the chance of subsequent pregnancy should if possible, be preserved in women who are desirous of having children or should have them irrespective of their own wishes. While the discussion of future possibilities with patients before operating has certain drawbacks, it also has certain advantages, and I believe the latter outweigh the former. It is true that the patient may live in fear of a subsequent tubal pregnancy and at times become very apprehensive. There is the decided advantage, however, that if it does take place the patient immedi-

ately consults a physician and, in fact, may herself make the correct diagnosis, as occurred in two of the four cases of repeated tubal pregnancy I have seen. But why remove the uterus? I do not consider that it is usually good surgical judgment to remove both tubes and leave the uterus in a patient who may previously have had a pelvic infection or may have pelvic adhesions after the operation. The possibilities of trouble subsequent to a hysterectomy are less than after a bilateral salpingectomy and the added danger in infertile cases is not appreciable. There was only one operative mortality in the fifty-one cases and that followed a unilateral salpingo-oophorectomy.

Methods of preserving and studying the material.—The injection mass used was fifteen per cent gelatin, which contained in suspension either a pigment or some material (usually bismuth subcarbonate) which is impervious to the X-ray. The methods of injecting, preserving, and studying the specimens were similar to those described in my paper "The Blood Supply of Uterine Myomata."¹

Photographs were made of cross or sagittal sections of the more interesting uteri where pigment was used in the injection mass and radiographs were made of cross "slices" of the uteri injected with bismuth. The contents of all the tubes, the seat of an ectopic pregnancy were examined microscopically. From three to six "blocks" were taken from different parts of the uterine wall, including the mucosa, and examined microscopically in order to ascertain the exact condition of the myometrium and endometrium in different parts of the uterus, and microphotographs were made of many of these.

The pregnancy in all the twenty-five cases was situated in the tube, the right tube being involved in nineteen and the left in six. Only one was of the interstitial variety. Ten definitely arose in the ampulla of the tube and four in the isthmus. In the remaining ten it was difficult to determine the exact part of the tube in which the pregnancy first developed, on account of the general distention of the greater portion of the tube. From their

appearance it would seem that in the majority if not in all of these ten, the pregnancy first developed in the ampulla. Tubal abortion was present in sixteen and rupture in eight, and in one (the one arising in the interstitial portion of the tube) the cornu of the uterus was about to rupture.

I regret that I am unable to present a complete study of this problem, as all the stages of ectopic pregnancy were not encountered in this series, and some of the most important ones were absent. In all of my cases the termination of the pregnancy had begun before I saw the patient, and the shortest time that had elapsed from the onset of these symptoms until the day of the operation, was three days, and the largest foetus found was only 6 cm. long.

All of the uteri in this series were studied with a knowledge of the clinical history of the case (not complete in every case).

The most important data in studying the influence of ectopic pregnancy on the uterus are first, the age of the ectopic gestation when the termination of the pregnancy began second the time that had elapsed from the onset of the termination of the pregnancy until the operation, and if completely terminated the date of the last severe attack of pain third the condition found within the pregnant tube, and especially whether the products of conception were still present or not, and, if present, what they were fourth whether or not uterine bleeding had been present, and especially if present the day of the operation. Other data are of interest, such as the age of the patient, her menstrual and marital history the situation of the ectopic pregnancy and the method of termination (whether by tubal abortion or rupture) and associated conditions, but all these are of secondary importance to those just mentioned.

The age of the ectopic gestation is difficult to determine even when the embryo or foetus is found if several days have elapsed since the beginning termination of the pregnancy because its growth might cease at that time or it may even become smaller (some are apparently entirely absorbed) or if it continued to grow its rate would probably be

retarded. The menstrual history is often of very little value in deciding this point, as in many instances the patient had not missed her menstrual period. The size of the tube may be misleading as an index of the age of gestation, as it depends upon several factors, the most influential of which is the amount of hemorrhage into the lumen of the tube and the ease with which it escaped into the peritoneal cavity. There was not any evidence in this series, of the blood in the tube escaping into the uterine cavity. I have attempted to determine the age of ectopic pregnancy from all the available factors in each case, relying for the most part on the conditions found within the tube. The embryo or foetus was found in six cases and five of these were still within the tube. The length of five of these was as follows 3 mm. 4 mm. 1.2 cm., 4 cm. and 6 cm., the sixth was 2.6 mm. In cross section (accidental finding in a stained section) The gestation sac was found in the tube in five other instances without any evidence of the embryo in the tube the latter having been absorbed or expelled. The greatest diameter of each of these five sacs was as follows 1 cm., 1.4 cm., 1.5 cm. 1.8 cm. and 2 cm. In ten specimens chorionic villi were found but the embryo or gestation sac was not seen in the four remaining cases no trace of the ectopic pregnancy was found other than the clotted blood. The five gestation sacs without embryos, the largest of which had a diameter of only 2 cm. and the three smallest embryos found in sacs having diameters of 1.2 2 and 3.5 cm., have led me to believe that the termination of the tubal pregnancy in these eight cases probably began within the first month and I believe that the majority of the others also terminated early the most advanced pregnancy containing a foetus only 6 cm. long.

The time that had elapsed since the onset of the termination of the pregnancy is based on the date of the first attack of pain, which is usually preceded by associated with or soon followed by uterine bleeding. Both symptoms were present in all but one of these cases, and in the majority of them more or less constantly until the operation. One

would expect that the condition of the uterus would change with the length of this time, and this was found to be true. Only two of the patients were operated upon within the first week of their acute illness, three between one and two weeks, three between two and four weeks, fourteen between four and eight weeks, and three after eight weeks. The longest time that had elapsed since the onset of symptoms suggesting the beginning termination of the pregnancy (pain and uterine bleeding) was seventy-two days; this patient was confined to her bed the greater part of this time and uterine bleeding continued more or less constantly throughout the time and was present the day of the operation. The termination of the pregnancy in this instance was incomplete, a gestation sac 3.5 cm. in its longest diameter was still in the tube and what appeared to be the remains of the embryo 4 mm. long within this sac.

In the case of the interstitial pregnancy the cornu of the uterus was about to rupture (see Case 25) and the gestation sac was still present, surrounded by blood, but no trace of the embryo was found. In twenty-one of the twenty-five cases of tubal pregnancy, as already stated, some of the products of conception were found within the tube. In these twenty-one cases the termination of the tubal pregnancy was *incomplete* in the fullest sense, although four weeks or more had elapsed in seventeen of them since the termination began and over eight weeks in three. In four cases no trace of the embryo or gestation sac were found within the tube. One of these had terminated by tubal abortion, and in the manipulation of the tube at the time of the operation a bloody mass was expressed from the fimbriated end of the tube, which was lost. In the remaining three the pregnancy had terminated by rupture and the tube was badly torn. Still in these three the apparent completion of the termination of the pregnancy may have been accomplished by the manipulation of the tube at the time of the operation and, furthermore, the fact that chorionic villi were not found does not prove that they were not there, for the entire tube was not examined microscopically. My own

studies (based on only twenty-five cases) have led me to believe that the *termination of the pregnancy is rarely complete* in the full sense of the term when the patient is operated upon, and as long as it is incomplete attacks of pain and uterine bleeding may occur.

Twenty-four of the twenty-five patients gave a history of uterine bleeding, usually inconstant and associated with attacks of pain. The only one which did not give a history of uterine bleeding showed intact decidua formation of the endometrium and a foetus 6 cm. long in a tube with a small opening in its upper surface through which chorionic villi protruded. In some the uterine bleeding preceded the pain and in others a severe attack of pain was the first indication of the beginning termination of the pregnancy. The exact relation between the two was not ascertained in all the cases. In all but three of the specimens some of the venous injection mass escaped from the endometrium into the uterine cavity and out the cervix when the specimen was injected, and in no instance did any of the arterial mass escape. *The uterine bleeding in all these cases was of venous origin and arose from the endometrium and in not a single instance did it escape from the tube into the uterine cavity.*

The associated tubal and ovarian conditions presented some unusual features. In one instance the pregnant tube communicated with the sigmoid through the fimbriated extremity and, aside from pain, attacks of bleeding from the rectum was the most marked symptom the patient had (see Case 23). In another case a necrotic parovarian cyst, 13 cm. in diameter with a twisted pedicle, was present in the opposite ovary (see Case 4). Retention cysts of the ovary were present in six instances, in two cases bilateral. I do not understand the significance of their occurrence. The definite results of previous pelvic inflammation were encountered in nine: a tubo-ovarian abscess once, a pyosalpinx once, hydrosalpinx once, bilateral tubal tuberculosis once, and in the remaining five old adhesions about the opposite tube and ovary. In eight instances the opposite tube and ovary appeared normal.

THE BLOOD SUPPLY OF THE NON PREGNANT UTERUS

I have already described certain features of this in two previous articles.¹ In connection with the study of the present subject, I wish to again briefly describe the blood supply of the uterus with special attention to that of the endometrium concerning which I have learned more since writing the previous articles.

The course of each uterine artery along the side of the uterus and its free anastomoses with the ovarian of the same side are well known. From each uterine artery branches arise at intervals which penetrate the uterus. These branches, which I have called arcuate arteries, pass between the outer and middle third of the anterior or posterior uterine wall and each one supplies a quadrantal segment of the uterus, corresponding to a segment of either the anterior or posterior half of the Müllerian duct of that side. They terminate in median (peripheral) and radial (centripetal) branches. The peripheral terminal branches of some of the arcuate arteries of one side anastomose freely with similar branches of the corresponding arcuate arteries of the opposite side, thus establishing a free arterial communication between the two uterine arteries. Along the course of each arcuate artery peripheral (centrifugal) and radial (centripetal) branches arise. The peripheral branches nourish the peripheral portion of the myometrium and the latter the remainder of the myometrium and the endometrium. The arterial system of the uterus enables us to divide the uterus into three zones first, the peripheral (the outer third) which is nourished by peripheral arteries second the arcuate the narrow (boundary) zone in which the arcuate vessels lie, and third the radial (the inner two-thirds, including the endometrium) which is nourished by radial arteries.

All the intrinsic uterine arteries pursue a spiral course, which is apparently a provision for the changes in size of the uterus and uterine contractions. There are free anastomoses between some of the branches of the

peripheral arteries. On the other hand the terminal branches of the radial arteries appear to be end arteries. When an arterial injection mass was used of sufficient coarseness so that it would not escape into the veins I found that while the radial arteries terminated in the endometrium this tissue appeared to be poorly supplied with arterial blood, as vessels containing the injection mass extended into it for only a short distance. On the other hand the examination of the endometrium with the higher powers of the microscope showed that arterioles with lumina too small to receive the injected mass were present. These arterioles or large capillaries seemed most abundant in specimens obtained during the premenstrual stage of the menstrual cycle and extended to the compact layer and tissues beneath the epithelium lining the uterine cavity. (See description of the uterus in early uterine and ectopic pregnancy.) In many specimens these arterioles were apparently very few in number or difficult to detect, and this seemed to be particularly true of patients operated upon in the post menstrual and interval stages of the menstrual cycle.

The venous system is as follows first, a rich plexus of the endometrium which is fed by the terminal branches of the radial arteries second a similar but larger plexus of the myometrium which communicates with that of the endometrium by venous channels. About the periphery of the myometrium, especially on the sides and sometimes accompanying the arcuate arteries, are collecting veins which convey the venous blood to the uterine veins between the layers of the broad ligament.

The arteries of the myometrium have distinct walls and these become physiologically sclerotic as the individual becomes older and furthermore there is a temporary thickening of some and destruction of others in the process of involution following childbirth. When studying the arteries of the myometrium we must not only know the age of the patient but if she has not yet reached the menopause whether or not she has had children, and if she has the date of the last childbirth.

The veins, except the collecting veins of the myometrium are for the most part lacking in

¹The Blood Supply of Uterine Myometrium, Surg. Gynec. & Obst., 1914, 18, 225.
²And The Influence of Myometrium on the Blood Supply of the Ovarian, Surg. Gynec. & Obst., 1915, 20, 101.

distinct walls, *i. e.*, there are merely spaces lined by endothelial cells between the bands of muscle fibers.

The arteries in the base of the endometrium have distinct walls, and the fine arterioles with lumina so small that they cannot be injected with bismuth or other granular pigments also have distinct walls, and they pursue a spiral course as the arteries in the myometrium. On the other hand the venous plexus of the endometrium as in the myometrium is composed of spaces in the stroma lined by endothelial cells. As there are not any valves in the uterine veins, the muscular efficiency of the uterus must play an important part in regulating the amount of blood in these spaces and the control of the same.

Just before the menstrual flow the endometrium is thickened and the glands are hypertrophied and there is often a distinct compact layer which may resemble the decidua of early uterine pregnancy. In addition the arterioles are more evident and apparently more numerous. The venous spaces are also dilated. Following the menstrual flow the endometrium becomes thinner, the compact layer is less evident, the glands are smaller and the arterioles are more difficult to detect and apparently fewer in number and smaller.

The premenstrual stage suggests the arterial invasion of the endometrium with the evidence of increased functional activity as in early pregnancy. Menstruation, on the other hand suggests labor and apparently is followed by a process of involution which differs in degree from the involution following the birth of a child, and one of its most important features is a diminished arterial supply and this is possibly an early step in the process of its involution.

THE BLOOD SUPPLY OF THE UTERUS OF EARLY PREGNANCY

The uterus is increased in size and this is due to several factors: first, the pregnancy within the cavity; second, arterial and venous hyperemia; and, third, the muscle fibers are probably larger.

As the present study of the changes of the uterus in early uterine pregnancy was under-

taken for comparing it with the changes in ectopic pregnancy, the description of the changes in the endometrium will be confined to the decidua vera.

The decidua vera resembles the endometrium of the premenstrual stage of the menstrual cycle except it is farther developed and this is apparently due in a large measure to its increased arterial supply. Sometimes it is very difficult to distinguish between the premenstrual endometrium and the decidua vera of early uterine pregnancy, especially as in very early pregnancy typical decidual cells are absent.

The endometrium of early pregnancy (Figs. 6 and 7) is thickened and may be divided into a compact and a glandular or spongy layer. The compact layer contains many arterial capillaries about which the decidual cells apparently first develop. Venous spaces are also present in the compact layer and especially at its junction with the spongy layer. The spongy layer owes its appearance to the hypertrophied uterine glands, and in places there is very little stroma between the glands. On the other hand trabeculae are found scattered through the spongy layer which unite the compact layer with the myometrium. These trabeculae consist of stroma and contain the terminal branches of the radial arteries whose arterioles are found in the compact layer. The arterial trabeculae as I have called them are much more distinct and their arteries are much larger than in the non-pregnant condition. The arterial injection mass, which in the non-pregnant condition usually extends only a short distance in the endometrium, is quite frequently found in the arterioles of the compact layer of the pregnant uterus. The arteries pursue a spiral course in the trabeculae, so that a longitudinal section gives the appearance of several vessels instead of one. There is often a decidual reaction of the stroma about the arteries in the trabeculae. The development of the compact layer with its increased arterial supply and the presence of the arterial trabeculae uniting the compact layer with the myometrium suggests that the changes in the decidua vera due to pregnancy are in a large measure dependent upon the invasion of its



Fig. Arterial supply of the uterine tissue. Radiograph (X) of cross slice (3 mm. thick) of the body of the uterus. Nullipara aged 34. Arteries injected with bismuth, uterus removed for chronic pelvic peritonitis. For detailed description of the arterial supply of the uterus see text. The radial arteries, *r*, the cestripetal branches of the arcuate arteries, are distinct, and the radiograph does not suggest any arterial sclerosis. Compare with Fig. 29.



Fig. Venous supply of the uterine tissue. Radiograph (X) of cross slice of the body of the uterus, as in Fig. Nullipara aged 30. Veins injected (ith bismuth through the terine and ovarian clms. Uterus removed for chronic pelvic peritonitis in the latter part of the interval stage of the menstrual cycle.

For detailed description of the venous supply see text. There is much venous plexus in the endometrium and the myometrium, and as there are not any valves in these plexuses, an intact endometrium and tonic condition of the uterine muscle are important factors in preventing bleeding at the uterine cavity.

tissues by arteries through these trabeculae. Venous spaces are found everywhere in the endometrium in the compact layer and the junction of the two layers, as well as in the arterial trabeculae and the stroma between the glands.

THE INVOLUTION OF THE UTERUS AFTER ABORTION

Bearing in mind the structure of the decidua vera of early pregnancy with its compact and loose spongy layer the trabeculae containing spiral arteries which cross the latter and terminate in the former and the venous spaces, especially those in the peripheral portion of the compact layer and at the junction of the latter with the spongy layer we would expect that the violent contractions of labor (abortion) would impair the arterial supply of the compact layer and otherwise damage the structure of the decidua vera especially at the junction of the two layers. We would expect this damage would lead to an extravasation of blood from the venous spaces and the ones most readily injured would be those in the superficial portion of the compact layer and at the junction of the two layers. As a result of abortion the gestation sac, together with the embryo or foetus are expelled. If the abortion is complete all the products of conception are expelled, the uterus under

goes involution, *i. e.* it becomes smaller and the bleeding soon ceases. The involutionary changes in the decidua vera of early pregnancy are apparently similar to those following menstruation.

In a specimen from a young woman nineteen years old whose uterus was removed for pelvic inflammatory conditions eight weeks after an abortion at the third month (her first pregnancy) I found that many of the radial arteries and their branches were markedly thickened and some of the branches were completely thrombosed. The latter changes were most evident in the branches just beneath the endometrium. The changes in the radial arteries and especially in the branches supplying the endometrium led me to believe that these are an important factor in the process of the involution of the endometrium.

If the abortion is incomplete *i. e.* some of the products of conception are still retained in the uterus the uterus remains enlarged uterine bleeding often occurs, and we speak of the condition as one of subinvolution which is clinically relieved by the complete removal of the products of conception. It is interesting to note, as will be shown later that the same



Fig. 3. The difference in the use of the affixes -ed and -en in the poems in the Russian group (N = 1) and in the Italian and American and S. African and unknown poems is shown in Figure 3. The poems are ranked by the use of the affixes -ed and -en. The difference in the use of the affixes -ed and -en is shown in Figure 3. The difference in the use of the affixes -ed and -en is shown in Figure 3. The difference in the use of the affixes -ed and -en is shown in Figure 3.

[illegible]

phenomenon, but in tubal pregnancy. If the termination of the tubal pregnancy is complete (that is, after the removal of the pregnant tube) the uterus is unaltered in situation. On the other hand, if it is incomplete, uterine action takes place, the uterus remains enlarged and the patient has attack of uterine bleeding often lasting several weeks (one of my cases over ten) after the beginning termination of the pregnancy. From this analogy I believe that in incomplete uterine abortion the retained product of conception till act the influence of pregnancy, a such up in the uterus and oppose the forces of involution so that the latter process is retarded by the retention of retained nidulation until it is expelled with it a so-called clinical phenomena.

REFERENCES

It is a general principle that the more the individual is involved in the process, the more likely he is to accept the result. This is why it is important to involve the individual in the process of decision-making.

(C) as in this d... I want to say or
suggested he kept a term... of the
many... pain but no... blood. The
pregnancy on part the... of the
up... not... on long... still in
the... The... of... of the
many... by... enough he... of
it... he... generated through...
gent... of... in... water. What
here... on... marriage... the...
(tonal)... to... probably... the
line of... the...

The specimens are layers of pink, greenish red and
the run in the marine blue. The injected
and white run in the green. The error
blending of the run in the green. The error
enlarged. The run in the green. The error
and error. The error. The error. The error.
specimen. The error. The error. The error.
are shown in kind. The error. The error.
plans of the error. The error. The error.



Fig. 5. Structure of the endometrium in the post-menstrual stage of the menstrual cycle. Photomicrograph (X 20) of portion of the endometrium. Para, aged 27, uterus removed for chronic pelvic peritonitis, veins injected with blausmith. The endometrium is thin, glands small and apparently few in numbers, the deep venous spaces (black) are dilated. Arterioles are difficult to detect (seen with higher magnification). The picture suggests diminished functional activity in marked contrast to the condition shown in the preceding illustration.

latter was greatly thickened (Fig. 6). Microscopically the venous plasma of the myometrium was greatly dilated, the arteries were larger than normal, and no evidence of arterial sclerosis was found.

The endometrium was greatly thickened, 7 to 1.5 cm. Small arteries were apparently more numerous and larger than in the non-pregnant condition; these were most abundant in the spongy layer. The venous spaces were dilated, especially in the middle portion. The compact layer showed true decidua, dilated venous spaces, an occasional artery and the ducts of the glands few in numbers and compressed; the stroma of this portion as everywhere infiltrated with round cells. In the spongy layer the stroma was dense, the venous spaces dilated, and glands few in numbers and atrophied.

The enlargement of the uterus with enema and arterial hypertension and the presence of true decidua were all manifestations of pregnancy. The dilated venous spaces in the decidua and atrophy of the glands in the spongy layer were manifestations of beginning involution due to regressive changes in the endometrium.

CASE. Age 33, para, last uterine pregnancy fourteen months before. Tubal pregnancy probably early, less than four weeks (?) symptoms began ten days after normal menstruation (see also



Fig. 6. The decidua vera of early uterine pregnancy. Photomicrograph (X 20) of portion of the decidua vera. Nullipara (repeated abortions) aged 37. Uterus was removed for chronic pelvic peritonitis and an ovarian cyst. Pregnancy was an accidental finding, gestation sac, 1 cm. long, was found in the uterus, embryo not found. Arteries injected with Veronal red and veins with blausmith; both appear black in the photomicrograph.

There is a distinct compact and glandular layer. In the latter are trabeculae (portion of one shown in the illustration) containing the terminal branches of the radial arteries. These trabeculae convey arterial capillaries to the compact layer and unite it with the myometrium. The development of the decidua vera suggests increased functional activity and seems to be directly dependent upon the arterial invasion of the endometrium from the terminal branches of the radial artery. Each pursue spiral course and therefore longitudinal section of one appears as several vessels. The degree of development of the compact layer seems to be in direct ratio with its arterial supply. Notice the rich arterial supply in the thickest portion of the compact layer.

(description of the pregnant tube) Operation five days after the onset of symptoms, suggesting the beginning termination of the pregnancy. Pain and uterine bleeding, flowing slightly at the time of the operation. The termination of the tubal pregnancy was by rupture and incomplete avulsion; all were found in the tube. The ampulla of the right tube was enlarged to 5 cm in its greatest diameter. An irregular opening, 1 cm. in diameter was present in its upper surface. Neither the embryo or gestation sac were found. A small cyst was present in the opposite ovary.

The veins were injected with blausmith. A small

Fig. (See frontispiece). Hypertension of the uterus with decidua formation. Uterus of tubal pregnancy (forty 6 cm. long). Colored photograph (X 20) of sagittal section of the uterus, arteries injected with Veronal red and veins with blausmith blue. Fetus 6 cm. long still present in the right tube (see Case 1). There was a small opening in the upper surface of the tube through which chorionic villi protruded, causing free hemorrhage into the peritoneal cavity. The fetus was probably alive at the time of the operation, and the influence exerted on the uterus as that of pregnancy. Uterine bleeding had not yet begun. The entire endometrium has taken part in the formation of decidua.



Fig. 7. The decidua vera of early uterine pregnancy. Photomicrograph (X 30) from the same section shown in Fig. 6. Little to one side of the latter. The same arterial trabecula is shown. A large venous space (upper left-hand portion of section) is situated at the junction of the compact and spongy layer, and smaller ones are scattered throughout the endometrium, but especially in the above situation. The extravasation of blood from these spaces into the spaces of the endometrium would tend to separate the compact from the spongy layer.

amount of the venous injection mass escaped into the uterine cavity. The uterus was slightly enlarged, 6.4 cm. in the greatest transverse and anterior-posterior diameters of the hardened specimen. Radiographs of cross slices of the uterus showed that the venous plexus of the uterine wall and endometrium are well injected, not dilated and the latter hypertrophied (Fig. 3). There was slight degree of sclerosis of some of the radial arteries and their branches probably due to previous uterine pregnancies.

The endometrium was hypertrophied 3 to 5 mm., surface irregular and covered with epithelium. The compact layer was thin and contained area of typical decidua formation with marked dilatation of some of the venous spaces. The spongy layer showed marked glandular hyperplasia (Fig. 3). Arterioles are more evident than in the non-pregnant uterus (Fig. 4). Uterine bleeding arose from the rupture of some of the superficial dilated venous spaces (Fig. 3). The condition found in this specimen suggests that complete involution of the endometrium would have occurred without the expulsion of decidua, as the uterine bleeding



Fig. 8. Sclerotic and thrombosed branches of radial arteries following uterine abortion. Photomicrograph (X 30) of portion of the uterine wall. Patient aged 34; first pregnancy, abortion at the third month; hysterectomy 12 months later for pelvic inflammatory conditions. Arteries injected with bi-smuth and run with ultramarine blue. Many of the branches of the radial arteries are sclerotic and some are thrombosed. I am unable to state the influence of the inflammatory process on the involution of the uterus. Apparently the process of involution following abortion is similar to that following full term pregnancy, differing only in degree. See next illustration.

arose from the superficial venous spaces of the compact layer and the latter was thin.

The hyperemia of the uterus and presence of decidua were manifestations of pregnancy. The dilated venous spaces in the decidua and escape of blood into the uterine cavity are manifestations of its solution due to regressive changes in the endometrium.

CASE 3. Age 34, para. last pregnancy three years before. Tubal pregnancy probably early missed period for nine days. See also description of the pregnant tube. Operation ten days after the onset of symptoms, suggesting the beginning termination of the tubal pregnancy via pain and uterine bleeding flowing slightly at the time of the operation. The termination of the pregnancy as by tubal abortion and incomplete. The ampulla of the right tube was enlarged to 3.5 cm. in its greatest diameter. The embryo as not found, but fragments of the gestation sac and chorionic villi were present in the tube. The opposite ovary contained cyst 3.4 cm. in diameter.

The veins were injected with bi-smuth and small amount of the venous injection mass escaped into the uterine cavity. The uterus was enlarged 6.7 to 5.8 cm. in the greatest transverse and anterior-posterior diameters of the hardened specimen. Radiographs of cross slices of the uterus showed the



Fig. 9. Sclerotic radial arteries, uterus of ectopic pregnancy but youngest child, as only twenty months old. Photomicrograph (X 20) of portion of the uterine wall. Patient aged 34, para youngest 1 only months, ruptured tubal pregnancy, the first symptoms of termination of the tubal pregnancy occurred thirty-four days before the operation. See Case 5. Many of the radial arteries are sclerotic. It is impossible to state whether result of the last uterine pregnancy or recent tubal pregnancy but probably the former.



Fig. 10. Hyaline remains of sclerosed branches of the radial arteries, uterus of ectopic pregnancy but youngest child, as only eleven months old. Photomicrograph (X 20) of portion of the uterine wall and endometrium. Patient aged 33, para youngest eleven months old, tubal pregnancy on one side, 1th tubal abortion and parovarian cyst, 1th twisted pedicle on opposite. See Case 4. The hyaline areas are the probable results of the uterine pregnancy eleven months before.

enous plexus of both the myometrium and endometrium are all injected and that of the latter dilated (Fig. 6). There was a slight degree of sclerosis of some of the radial arteries. The endometrium (Fig. 7) was thickened 1 to 4 mm. surface thrown into folds and covered with epithelium. The hypertrophy was due mainly to the dilatation of the venous spaces, especially in the distal portion (compact layer) which in places suggested typical decidua. The glands were for the most part small, an occasional one showed hyperplasia. Arterioles seemed more evident than in the non-pregnant condition. The bleeding arose from the rupture of the superficial venous spaces.

The influence of pregnancy was still evident in the uterus, as shown by the thickened endometrium, decidua, and a few hyperplastic glands. The changes due to the early part of the regressive stage of involution predominated, namely dilated venous spaces with escape of blood into the uterine cavity and atrophy of many of the glands of the spongy layer.

CASE 4. Age 28 para. last term pregnancy eleven months before. Tubal pregnancy probably early missed one menstruation, onset of symptoms two weeks later. See also description of the pregnant tube. Operation twelve days after the onset of symptoms, suggesting its beginning termination of the tubal pregnancy. pain and ter-

bleeding, flowing at the time of the operation. The termination of the tubal pregnancy was by tubal abortion and incomplete. The left tube was distended with a blood clot (greatest diameter 4 cm.) in the center of which was gestation sac 1 cm in diameter embryo not found. A parovarian cyst, 13 cm. in its largest diameter was present on the opposite side this was necrotic, due to twisting of its pedicle. It was impossible to ascertain the exact relation between the tubal abortion and twisting of the pedicle of the parovarian cyst.

The arteries were injected with bismuth and the veins with ultramarine blue. A small amount of the venous injection mass escaped into the uterine cavity. The uterus was slightly enlarged to 6 x 4 cm. in the greatest transverse and antero-posterior diameters of the hardened specimen. Radiographs of cross slices of the uterus showed that the arteries had small lumina, due to the extensive sclerosis present.

There was marked sclerosis of many of the radial arteries and their branches, probably due to the uterine pregnancy eleven months before. The endometrium was thin, its surface in places rough but covered with epithelium. Compact layer was absent glands small, stroma dense, arteries small and difficult to detect venous spaces dilated, no decidua, bleeding rose from the venous spaces. The influence of the ectopic pregnancy on the uterus had disappeared except for retardment



Fig. 2. Venous hyperemia of the uterus and decidua formation. Very early tubal pregnancy. Radiograph (X) of cross slice, 4 mm thick, of the uterus; also injected with bismuth. Operation five days after the beginning of termination of the pregnancy. Tubal rupture chorionic. Still in the tube (see Case 1). While involution had begun, the influence exerted on the uterus by the pregnancy still predominates (see Figs. 3 and 4).

of involution. The condition present was that of the regressive stage of involution.

CASE 5. Age 31, para youngster three years, a miscarriage at the third month occurred four months before tubal pregnancy as probably very early patient had not missed her menstrual period and the tube was only slightly enlarged, embryo not found. Operation twelve days after the onset of symptoms, suggesting the beginning termination of the pregnancy. A pain and uterine bleeding. The termination of the tubal pregnancy was by tubal abortion and apparently complete. A hematocoele was found and in removing the uterus and tube an egg-shaped clot was forced out of the tube thus apparently completing the abortion. Chorionic villi were not found in the tube.

The arteries were injected with bismuth and the veins with ultramarine blue. Small amount of the venous injection mass escaped into the uterine cavity. The uterus was very little (if any enlarged), 5-4 cm. in the greatest transverse and anterior posterior diameters of the hardened specimen. The gross appearance of the uterus, as negative except for small amount of the venous injection mass in the uterine cavity. Radiographs of cross slices of the uterus demonstrated that the lumina of the arteries were small. There was a quite marked degree of microclots of many of the radial arteries and their branches probably due to recent uterine pregnancies. The endometrium was thin, to 2.5 mm. surface rough covered with epithelium. The distal portion of the stroma stained faintly as though the tissues were poorly preserved. Venous plexus dilated no evidence of decidua, gland small and appeared few in numbers. The influence of the ectopic pregnancy on the uterus had disappeared. The condition present was that of the latter part of the regressive stage of involution.



Fig. 3. Uterine decidua of early tubal pregnancy. Photomicrograph (X, 80) of portion of the endometrium from the uterus shown in Fig. 2. It resembles very closely the decidua of the early uterine pregnancy shown in Figs. 6 and 7. There is distinct compact spongy layer; an arterial trabecula is present near right-hand border of the section. As in early uterine pregnancy the development of the decidua is apparently dependent upon the arterial invasion of the endometrium from the terminal branches of the radial arteries. It differs from the decidua shown in Fig. 6 in that the arterial supply is not as well developed. The compact layer is not so thick as in the decidua shown in Fig. 6. It is much earlier (tubal pregnancy). Involution had begun, as shown by the dilatation of the venous spaces and escape of blood into the uterine cavity (See also Fig. 5).

CASE 6. Age 31, first pregnancy. Age of tubal pregnancy as not determined. She thought she was three months pregnant and had been treated for supposed incomplete terine abortion 8 days before her present operation. Operation three weeks after the onset of symptoms, suggesting the beginning termination of the pregnancy. A pain and uterine bleeding, flowing slightly at the time of the operation.

The termination of the tubal pregnancy, as by rupture and apparently complete manipulation of the tube at the time of the operation may have completed the termination of the pregnancy. A hematocoele was found about the right tube which was extensively infiltrated by the rupture. Chorionic villi were not found. A procoagulable was present on the opposite side. The uterus was injected with bismuth. The uterus was enlarged to 6-4.5 cm. in the greatest transverse and anterior posterior diameters of the hardened specimen. Radiographs of the cross slices of the uterus showed that the shadow cast by the radial arteries were of normal

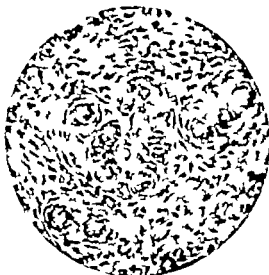


Fig. 14. Arterioles in the compact layer of the decidua of early tubal pregnancy. Photomicrograph (X 30) of portion of the compact layer shown in Fig. 3. Tortuous arterioles with very small lumina are present in the compact layer and much more evident than in the non-pregnant condition, emphasizing that the development of the decidua and formation of compact layer are dependent upon the arterial invasion of the endometrium.



Fig. 5. Beginning involution of the uterine decidua of early tubal pregnancy. Photomicrograph (X 30) of portion of the endometrium, Case 1 (from same uterus as Figs. 3 and 14). It shows well the dilatation of the venous spaces (black) apparently due to regressive changes in the stroma of the endometrium and possibly relaxation of the uterus. In this specimen the uterine bleeding arose from the superficial venous spaces, one shown about to rupture. Involution of the endometrium would probably occur in this case without the formation of decidua, as the compact layer is thin (early pregnancy) and the rupture of the dilated superficial venous spaces would not separate the two layers.

case. There was very little if any evidence of sclerosis of the radial arteries, first pregnancy and only shortly after its termination. The endometrium was thin, to mm rough, but for the most part covered with epithelium (curetted five days before) the glands were hypertrophied. No evidence of decidua.

It is impossible to draw any definite conclusion as to the relative influence of pregnancy and involution on account of the recent curettage.

CASE 7. Age 30, para, last pregnancy nine years before. Tubal pregnancy was very early, skipped menstrual period for five days. See description of tube. Operation twenty-five days after the onset of symptoms, suggesting the beginning termination of the tubal pregnancy viz., pain and uterine bleeding, flowing at the time of the operation. The termination of the pregnancy was by rupture through the upper wall of the tube incomplete. A hematocele was found about the right tube the middle portion of which was dilated to diameter of 2.5 cm. A small ragged opening about 3 mm. in diameter was found in the upper surface of this. A tubo-ovarian abscess was present on the opposite side. The embryo 3 mm. in cross section, was found in gestation sac (1 cm in diameter) in the stained section of the tube.

The veins were injected with bismuth and large amount of this injection mass escaped into the uterine cavity. The uterus was enlarged to

5.7-5.4 cm. in the greatest transverse and anterior posterior diameters of the hardened specimen. Radiographs of cross slices of the uterus showed that the venous plexus of both the myometrium and endometrium were well injected and dilated. There was moderate degree of sclerosis of the radial arteries.

The endometrium (Fig. 9) was thin, to mm., rough but covered with epithelium, except where the injection mass had escaped. The compact layer for the most part was bent though persisting in places as polypoid projections. The stroma of these projections suggested typical decidua and contained arterioles and venous spaces. The glands of the spongy layer were narrow elongated, few showed hyperplasia. The venous spaces were dilated. The bleeding arose from the rupture of the superficial venous spaces.

The influence of the ectopic pregnancy on the uterus was shown in the persistence of portions of the compact layer and hyperplastic glands. The regressive stage of involution presented itself in the partial destruction of the compact layer dilated venous spaces, partial atrophy of the glands, and uterine bleeding.

CASE 8. Age 30, para, last (only pregnancy) ten years before, followed by postperforation infection

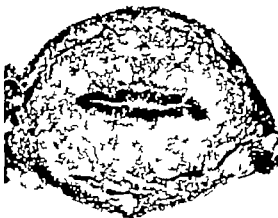


Fig. 6 Venous hyperplasia of the uterus, especially of the plexus of the endometrium; subinvolution of early tubal pregnancy. Radiograph (X) of cross slice (5 mm. thick) of the fundus of the uterus, veins injected with bismuth. Operation ten days after the beginning termination of the pregnancy. Incomplete tubal abortion, gestation sac and chorionic villi in the tube, embryo had disappeared (Case 4). The uterus is influenced both by the forces of involution and pregnancy and, therefore, condition of rubra oblation exist (see Fig. 7).



Fig. 7 Early part of regressive stage of involution of the uterus, its dilatation of the cross spaces and uterine bleeding. Photomicrograph (X 20) of portion of the endometrium (Case 5 and Fig. 6.) The early part of the regressive stage of involution is shown by the dilatation of the cross spaces (black), especially the superficial ones, and the escape of the injection mass into the uterine cavity. The majority of the glands are no longer hyperplastic. The patient has been bleeding for ten days, and involution is still in the regressive stage and is retarded by the products of conception in the tube.

Tubal pregnancy was probably very early; patient had missed her period for only ten weeks. See also description of tube. Operation ten days after the onset of symptoms suggesting the beginning termination of the pregnancy. Pain and uterine bleeding. The termination was by tubal abortion incomplete. The right tube was filled with clot 3 mm. in its greatest diameter and partially protruding through the imbricated end. A gestation sac, 1.8 cm. in diameter. About the embryo was found in the tube.

The arteries were injected with bismuth and the veins with ultramarine blue. Small amount of the venous injection mass escaped into the uterine cavity. The uterus slightly enlarged to 5.8 x 4.3 cm. in the greatest transverse and anterior-posterior diameters of the hardened specimen. The gross appearance of the uterus was negative except for small amount of the venous injection mass in the uterine cavity and area in the uterine wall which proved to be adenomyomata. Radiographs of cross slices demonstrated that the arteries contained very little of the injection mass (later shown to be due to the arterial sclerosis). There was marked degree of sclerosis of many of the radial arteries and their branches. Many small adenomyomata are present. The endometrium was thin, 1 mm. Surface thrown into folds, covered with epithelium. Compact layer for the most part was absent, no decidua. Glands small and few in numbers, stroma dense, venous spaces dilated only, very few arteries are seen. The effect of pregnancy had

almost disappeared. The condition of the endometrium that of the latter part of the regressive stage of involution.

CASE 6. Age 35 para last uterine pregnancy four years before. Tubal pregnancy early probably less than four weeks. Seen symptoms of its termination began. See description of the pregnant tube. Operation four weeks after the onset of symptoms, suggesting the beginning termination of the pregnancy. Uterine bleeding, but pain had been present for only ten days, therefore probably only ten days had elapsed since the active beginning termination of the pregnancy. Uterine bleeding the day of the operation.

The termination was by tubal abortion, though beginning signs of rupture are present incomplete. A hematocele was found about the right tube which was distended (greatest diameter 3 cm.). Its blood. In the center of this was the ovum, 1 cm. in its greatest diameter and had as apparently the remains of the embryo, 3 mm. long. The arteries are injected with ultramarine blue and the veins with bismuth. The venous injection mass escaped freely into the uterine cavity. The uterus was slightly enlarged to 6 x 4 cm. in the greatest transverse and anterior-posterior diameters of the hardened specimen. Radiographs of cross slices of the uterus showed that both the plexus of the myometrium and endometrium are well injected.



Fig. 8. Regressiv stage of involution of the endometrium. Ith extravasation of the injection mass bet. con the compact and spongy layers and the formation of decidual cast. Photomicrograph (X 20) of portion of the endometrium, also injected ith biemuth (Case 9). Operation four weeks after the first sign of uterine bleeding but only ten days after the first attack of pain. Incomplete tubal abortion, gestation sac ith remnant of embryo still in the tube. Endometrium thin, glands small, extravasation of the injection mass into the tissues of the endometrium, separating the compact from the spongy layer and causing decidual cast. A condition of subinvolution exists, still in regressiv stage. The incomplete termination of the pregnancy apparently prevented the complete involution of the uterus.

but not distended, probably due to the free escape of the injection mass into the uterine cavity. There was a moderate degree of sclerosis of some of the radial arteries.

The endometrium (Fig. 8) varied from 1 mm. thickness, for the most part covered with epithelium. The compact layer resembled typical decidua and in places was separated from the spongy layer by an extravasation of the venous injection mass, thus forming decidual cast. The glands in the spongy layer were small and few in numbers, stroma dense. A few small arteries were seen in the base of the spongy layer.

The remains of the influence of pregnancy are still present in the compact layer of atypical decidua, which was partially separated from the spongy layer by the extravasation of the blood (injection mass). The regressive stage of involution was evident with the formation of decidual cast, due to the above described extravasation of blood.

CASE 9. Age 37 para, youngest child fifteen years old (on miscarriage 8 years ago). Tubal pregnancy probably early when symptoms of its termination began. See description of the pregnant tube. Operation four weeks after the onset of symptoms, suggesting the beginning termination of the pregnancy. Attacks of pain and uterine bleeding, flowing slightly the day of the operation.

The termination was by tubal abortion, though beginning signs of rupture were present termination incomplete. A hematocele was found about the right tube, which was distended with blood (greatest diameter 4.5 cm.). A gestation sac, 3.8 cm. in its largest diameter was found in the tube in which was a well-formed embryo 1 cm. in length. The arteries were injected with ultramarine blue



Fig. 9. Regressiv stage of involution of the endometrium, dilated venous spaces and partial loss of the compact layer. Photomicrograph (X 20) of portion of the endometrium, also injected with biemuth (see Case 7). Operation twenty-five days after the beginning termination of the pregnancy. Termination by rupture (incomplete) gestation sac and embryo still in the tube. In places the compact layer is still present (appears as polyp in the illustration) but for the most part it has disappeared. The venous spaces are dilated and some of the glands are still hyperplastic. The influence of pregnancy manifests itself by the persistence of areas of the compact layer and hyperplastic glands, and that of involution by the loss of the greater part of the compact layer, dilated venous spaces and trophic glands. The influence of pregnancy has delayed the involution of the endometrium.

and the veins with biemuth. Small amount of the venous injection mass escaped into the uterine cavity. The uterus as enlarged to 7.5 cm. in the greatest transverse and anterior-posterior diameters of the hardened specimen. Radiographs of cross slices of the uterus showed that both the plexus of the myometrium and endometrium were well injected. There was moderate degree of sclerosis of some of the radial arteries. The endometrium varied in thickness from .5 to .5 mm. The surface was relatively smooth, covered with epithelium. The compact layer was thin and did not resemble decidua, stroma dense, venous spaces dilated. The glands of the spongy layer were small, stroma dense. The arteries were apparently few in number. The dilated venous spaces, with uterine bleeding, and small glands indicated involution retarded by the pregnancy.

CASE 10. Age 34 para last terine pregnancy year before. Tubal pregnancy possibly of six to eight weeks duration before its beginning termination, as the patient had skipped two menstrual periods, but began to flow few days after the last period was due. Operation four weeks after the



Fig. 19. Regressive stage of involution of the endometrium: extravasation of the injection mass into its spaces. Retardment of involution. Photomicrograph (X 20) of a portion of the endometrium: also injected with blue (see Case 8). Operation six weeks after the beginning termination of the pregnancy. The termination was by rupture, apparently complete, but completed (last severe attack of pain 15 days before the operation) just before the operation. The endometrium is thin, glands atrophied, and there is no evidence of the influence of pregnancy other than the retardment of the involution. The latter is still in the regressive stage as shown by the extravasation of the injection mass into the spaces.



Fig. 20. Distention of the venous plexuses of the uterus, subinvolution of early total pregnancy. Radiograph (X 1) of a cross slice (4 mm thick) of the uterus, also injected with blue (see Case 7). Operation five weeks after the beginning termination of the pregnancy. Incomplete total abortion. Chorionic villi still in the tube, embryo had disappeared (Case 7). The endometrium is atrophied, but the venous spaces of both the endometrium and myometrium are dilated, suggesting relaxation of the uterus. Involution is still in the regressive stage and its completion is apparently prevented by the influence exerted by the remnant of the pregnancy in the tube (see also Fig. 3).

onset of symptoms, suggesting the beginning termination of the pregnancy: pain and uterine bleeding, flowing freely the day of the operation.

The termination was by total abortion and incomplete. The distal portion of the left tube was distended with pear-shaped blood clot $7 \times 4 \times 5$ cm, partially protruding through the fimbriated opening. Chorionic villi were found in this clot but not the embryo. The arteries were injected with Venetian red and the veins with ultramarine blue; there was a free escape of the venous injection mass into the uterine cavity. The uterus was slightly enlarged to 5.8×4.4 cm. in the greatest transverse and anterior posterior diameters of the hardened specimen. In the gross specimen the veins of the myometrium and endometrium appeared dilated, and the uterine cavity was filled with the venous injection mass, which escaped from the endometrium (Fig. 20). Many of the radial arteries showed marked sclerosis; few arterial shadows are seen near the endometrium; last uterine pregnancy year ago.

The endometrium varied in thickness from 1

5 mm. Its surface was covered with epithelium. A definite compact layer was lacking, no evidence of decidua. The glands were small and few in number; the stroma was dense, the venous spaces were markedly dilated, a few arteries were seen in the base of the endometrium. The dilated venous spaces, thin endometrium, absence of decidua, small glands, few arterioles, and uterine bleeding indicated the regressive stage of involution prolonged by the pregnancy.

Case. Ago (?), para, last uterine pregnancy three years before followed by puerperal infection, puerperal pelvic abscess was incised and drained extraperitoneally through the groin. Tubal pregnancy was early. See description of the tube. Operation four weeks after the onset of symptoms, suggesting the beginning termination of the pregnancy: pain and uterine bleeding, flowing the day of the operation. The termination of the pregnancy was by total abortion and incomplete. The distal portion of the right tube was distended with blood clot, 5×2.8 cm., partially protruding from the fimbriated extremity. In the center of the blood clot was the gestation sac, 1.4 cm. in its longest diameter. The embryo was not found. Small bilateral ovarian cysts were present.

The arteries were injected with Venetian red and the veins with ultramarine blue; small amount of the venous injection mass escaped into the uterine cavity. The uterus was but slightly enlarged, 5.5×4 cm. in the greatest transverse and anterior posterior diameters of the hardened specimen. The gross appearance of the injected uterus was negative except for slight amount of the venous injection mass in the uterine cavity. Many of the radial arteries showed a marked degree of sclerosis (uterine pregnancy three years before). The endometrium

Fig. 20. (See frontispiece.) Regressive stage of involution of the uterus and uterine bleeding. Colored photograph (X 1) of sagittal section of the uterus, arteries injected red and veins blue (see Case 7). Operation four weeks after the beginning termination of the pregnancy; total abortion; chorionic villi still in the tube. The influence of pregnancy was not evident in the uterus except as involution was retarded and the regressive stage persisted with uterine bleeding.



Fig. 3. Subinvolution of the endometrium, latter part of regressive stage. Photomicrograph (X 50) of portion of the endometrium from the specimen shown in Fig. 1. The endometrium is atrophied, glands small, venous spaces dilated and an extravasation of the injection mass has occurred into the superficial tissues of the endometrium. There is no apparent evidence of the influence of pregnancy on the uterus other than the retardation of involution.

varied in thickness, 2.5 to 3 mm. Its surface was smooth, covered with epithelium. The compact layer was ordematous, venous spaces dilated, did not resemble decidua. The glands of the po ry layer were small, stroma dense and arterioles difficult to detect. This condition indicated the regressive stage of involution.

CASE 3. Age 37 para, last uterine pregnancy nine years before. Tubal pregnancy probably very early slipped period fourteen days. See description of the tube. Operation four weeks after the onset of symptoms, suggesting the beginning termination of the pregnancy i. e. pain and uterine bleeding but very little pain since the onset suggesting that the termination was nearly completed with the first attack of pain.

The termination of the tubal pregnancy was by rupture through the upper lip of the left tube about 2.5 cm from the amputated extremity. The tube was only slightly enlarged (1.5 cm in its greatest diameter) and its lumen was filled with clotted blood. The termination of the pregnancy was not quite complete as few chorionic villi were found in the tube.

The arteries were injected with red lead and the veins with ultramarine blue. A small amount of the venous injection mass escaped into the uterine cavity. The uterus was enlarged 6-4.5 cm. in the greatest transverse and anterior posterior diameters of the hardened specimen. The gross appearance of the injected uterus was negative except for small amount of the venous injection mass in the uterine cavity and the endometrium appeared hypertrophied. Some of the radial arteries showed moderate degree of sclerosis. The endometrium varied from 4 to 6 mm in diameter, the surface was smooth and covered with epithelium. The compact layer was ordematous and venous spaces dilated, and in places clotted blood in the stroma. The glands were moderately dilated, arteries in places easily detected. The thickened endometrium, with definite compact layer moderate glandular hyperplasia, and increased arterial supply suggested the premenstrual stage of the endometrium, i. e. nearly complete involution of



Fig. 4. Subinvolution of the endometrium, close of regressive stage or beginning reparative stage. Photomicrograph (X 50) of portion of the endometrium and myometrium; mass injected with bismuth. Operation four weeks after the beginning termination of the pregnancy. The termination was by abortion and incomplete as gestation sac and chorionic villi were still present in the tube; the embryo had disappeared (Case 14). The endometrium is thin, surface relatively smooth, glands atrophied. Venous spaces dilated, but there was very little extravasation of the mass into the tissues of the endometrium (none in this section). Pregnancy has apparently retarded the progress of involution, and the latter is still in the regressive stage. Similar to Fig. 5 showing the postmenstrual stage.

the latter (Fig. 8). Involution had been progressing for four weeks with very little interference from the remains of the tubal pregnancy as only a few chorionic villi were present in the tube and the history suggested the nearly complete termination of the pregnancy with the first attack of pain four weeks before.

CASE 14. Age 30, para, and three miscarriages. Tubal pregnancy was probably early had not missed her menstrual period. See also description of the tube. Operation four weeks after the onset of symptoms, suggesting the beginning termination of the pregnancy viz., pain and uterine bleeding, flowing slightly the day of the operation. The termination of the pregnancy was by tubal abortion and incomplete. A hematocoele was found about the left tube which was distended to diameter of 4 cm., gestation sac 1 cm. in diameter was present in the tube but the embryo was not found.

The arteries were injected with ultramarine blue and the veins with bismuth a small amount of the venous injection mass escaped into the uterine cavity. The uterus was slightly enlarged to 5-4.5 cm. its greatest transverse and anterior

Fig. 11. (See frontispiece.) Nearly complete involution of the uterus. Colored photograph (X 10) of sagittal section of the uterus; arteries red and veins blue. Operation four weeks after sudden severe attack of pain and collapse, suggesting the nearly complete termination of the tubal pregnancy with the first attack of pain (see Case 3). The nearly complete involution of the uterus has taken place, and though there were still few chorionic villi in the tube their influence had gradually subsided and recently had very little influence on involution.



Fig. 5. Rupture of the endometrium, beginning reparative stage. Incomplete (tubal abortion of early tubal pregnancy. Photomicrograph (X 70) of portion of the endometrium and myometrium, days injected with bi-month. Operation five weeks after the beginning termination of the pregnancy. A few chorionic villi are still in the tube; embryo had disappeared. (Case 6.) The endometrium is thicker than in Fig. 24. Surface thrown into folds; glands still trophicized, and venous spaces dilated, but not the superficial ones. Involution has begun and is still retarded by the influence of pregnancy; but the process of repair begins to manifest itself.

posterior diameter of the hardened specimen. Radiograph of cross slices of the uterus showed marked dilatation of the venous plexus of the inner two-thirds of the uterine wall and the endometrium.

Some of the radial arteries showed moderate degree of sclerosis. The endometrium varied in thickness from 3 to 5 mm., for the most part smooth and covered with epithelium. A compact layer was absent over the greater portion of the endometrium; no evidence of decidua. A few arterioles were seen, glands small, stroma dense. Venous spaces were dilated from those the uterine bleeding arose. The thick endometrium, absence of decidua, dilated venous spaces, uterine bleeding, small glands, and poor arterial supply indicated the regressive stage of involution, apparently maintained by the remnant of the pregnancy in the tube.

CASE 5. Age 34, para youngest child twenty months old. The age of the tubal pregnancy was not determined but probably early. Operation thirty-four days after the onset of symptoms suggesting the beginning termination of the pregnancy. Pain and uterine bleeding, flowing at the time of the operation. The termination of the pregnancy was by rupture. A hematocoele was found about the left tube which had ruptured, severe pain only a few days before the operation. The embryo was not found and no chorionic villi were found in the tube.

The arteries were injected with Venetian red and the veins with bismuth; the venous injection mass escaped into the uterine cavity. The uterus was slightly enlarged, to 5.8 x 4 cm. in its greatest transverse and anterior-posterior diameters of the



Fig. 26. Rupture of the endometrium, beginning reparative stage. Rupture (complete termination) of early tubal pregnancy. Photomicrograph (X 80) of portion of the endometrium, veins injected with bi-month. Operation thirty-four days after the beginning termination of the pregnancy. (Case 5.) The endometrium is thicker than the one shown in Fig. 24. Surface thrown into folds. Glands larger (more active) but superficial venous spaces still dilated and the injection mass escaped into the uterine cavity. The process of repair has apparently begun, but the influence of the pregnancy, recently terminated, has retarded the involution of the uterus.

hardened specimen. The gross appearance of the cut surfaces of the uterus, as well as except for small masses of the venous plexus in the uterine cavity. Radiographs of cross slices of the uterus showed that the venous plexus of the myometrium was not dilated. There was marked degree of sclerosis of many of the radial arteries, probably due to uterine pregnancy twenty months before.

The endometrium (Fig. 26) varied from 3 to 5 mm. in thickness, and covered with epithelium. The compact layer was rudimentary in places and the venous spaces dilated. The glands were moderately dilated, suggesting activity. The condition found suggested beginning repair of the endometrium as in Case 5. Bleeding arose from the dilated venous spaces. The thickened endometrium with formation of compact layer, dilated glands, and increased arterial supply indicated the reparative stage of involution. The dilated venous spaces and uterine bleeding showed that the regressive stage had not ceased.

CASE 6. Age 19, para age of children 7. It had pregnancy was probably early although the tube contained a very large blood clot. Operation five weeks after the onset of symptoms, suggesting the beginning termination of the pregnancy. Pain and uterine bleeding, flowing slightly at the time of the operation. The termination of the pregnancy was by tubal abortion and not complete, as chorionic villi were found in the tube. A hematocoele was found about the right tube which was distended with blood clot 7 cm. in its greatest diameter. An ovarian cyst 5 cm. in diameter as present on the opposite side.



Fig. 7. Complete involution of the endometrium, end of reparative stage. Photomicrograph (X 30) of portion of the endometrium (poorly injected). Operation forty days after the beginning termination of the pregnancy, and ten weeks after any severe pain (see Case 30). The endometrium is hypertrophied, surface rough, there is hyperplasia of the glands; the picture resembles the premenstrual stage of the non-pregnant uterus (Fig. 4).

The arteries were injected with ultramarine blue and the veins with blamuth. A small amount of the venous injection mass escaped into the uterine cavity. The uterus was only slightly enlarged, 4.8 x 4 cm. in the greatest transverse and anterior posterior diameters of the hardened specimen. Radiographs of cross slices of the uterus showed the cross plexus of the myometrium as only fairly well injected and moderately dilated. There was a moderate degree of sclerosis of many of the radial arteries. The endometrium (Fig. 5) varied in thickness from 1.3 mm. Surface corrugated and covered by epithelium. Compact layer thin, no decidua, glands few in number and not hypertrophied, stroma moderately dense, arteries few in number. Venous spaces dilated. Condition suggests beginning repair of the endometrium.

CASE 7. Age 35 first pregnancy (married ten years). The tubal pregnancy as very early had not missed her period. (See also description of the pregnancy to be.) Operation five weeks after the onset of symptoms suggesting the beginning termination of the pregnancy viz. pain and uterine bleeding, slight uterine bleeding at the time of the operation. The termination of the pregnancy, as by tubal abortion and incomplete, as hystero-

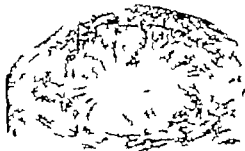


Fig. 30. Evidence of arterial sclerosis, uterus of early tubal pregnancy (sclerosis probably due to recent uterine pregnancy). Radiograph (X 30) of cross slice (3 mm. thick) of the uterus arteries injected with blamuth. Operation eleven days after the beginning termination of the pregnancy (incomplete tubal abortion (see Case 4). The arteries appear to be poorly injected, dense arteriosclerosis, causing narrowing of the lumina. Compare with Fig. 1. Youngest child eleven months old, probable cause of arteriosclerosis—patient age 35. All cases must be studied with knowledge of the age of the patient, and if possible the date of the last pregnancy.

villi were found in the tube. A hematocoele was present about the right tube the ampulla of which was distended with a blood clot 4 cm. in its greatest diameter. Gestation sac and embryo were not found. Both tubes showed tuberculous.

The arteries were injected with ultramarine blue and the veins with blamuth. A small amount of the venous injection mass escaped into the uterine cavity. The uterus was slightly enlarged, 5. x 4 cm. in the greatest transverse and anterior posterior diameters of the hardened specimen. Radiographs (Fig. 6) of cross slices of the uterus showed the venous plexus of both the myo- and endometrium were well injected and dilated. There was a moderate degree of sclerosis of many of the radial arteries.

The endometrium (Fig. 5) was in many places less than 1 mm. in thickness and covered with epithelium. A compact layer was absent, no decidua. The glands were small few in number, stroma dense and no evidence of tuberculous. Arteries were not seen some of the venous spaces were greatly dilated and subepithelial extravasations of the injection mass were present with rupture and escape of the mass into the uterine cavity. The thin endometrium, absence of decidua, small glands, poor arterial supply dilated venous spaces, and uterine bleeding indicated the latter part of the regressive stage of involution.

CASE 8. Age 35 para, youngest twelve years old, no miscarriage ten years before present operation. Tubal pregnancy probably early had not missed the menstrual period. See also description of the tube. Operation six weeks after the onset of symptoms suggesting the beginning

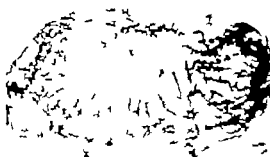


Fig. 30. Evidence of arterio-sclerosis, uterus of later uterine total pregnancy but parous woman, youngest child nine years old. Radiograph (slightly reduced) of cross slice (1 area, thick) of the lumen of the uterus through the longitudinal pregnancy. Arteries injected, rib red lead. Operation thirty-two days after the beginning termination of the pregnancy (see Case 31). The radial arteries appear to be poorly injected, due to narrowing of the lumina. There is an extrusion of the arterial injection mass between the gestation sac and surrounding uterine tissue. Patient 57 years old, last uterine pregnancy nine years ago. The degree of arterio-sclerosis suggests that it may in part be due to involution of the uterus following the beginning termination of the tubal pregnancy 3 day before.

termination of the pregnancy viz. pain and uterine bleeding flowing freely at the time of the operation. The termination of the pregnancy was by rupture and was apparently complete. Chorionic villi were not found in the tube still the manipulation of the tube at the time of the operation may have completed the termination of the pregnancy. A large hematocoele was found about the right tube the ampulla of which had ruptured.

The arteries were injected with Venetian red and the veins with blasmuth. A large amount of the venous injection mass escaped into the uterine cavity. The uterus was slightly enlarged, to 5.4 cm. in the greatest transverse and anterior posterior diameters of the hardened specimen. Radiographs of cross slices of the uterus showed that the venous plexus of the myometrium was poorly injected and not dilated probably due to the free escape of the mass into the uterine cavity. Microscopically many of the radial arteries and their branches showed a moderate sclerosis. The endometrium (Fig. 30) was thin, from 1 to 2 mm. rough, covered with epithelium, except where the injection mass escaped into the uterine cavity. There was no definite compact layer or decidua. The glands were small and few in number and the stroma dense. A few small arteries were seen in the stroma (sections examined). Only a few of the venous spaces of the endometrium were dilated. The venous injection mass had escaped into the spaces of the endometrium and from there into the uterine cavity. The thin endometrium, absence of decidua,

small glands, poor arterial supply escape of blood into the stroma of the endometrium, and uterine bleeding indicated the regressive stage of involution maintained for six weeks by the incomplete termination of the tubal pregnancy last attack of severe pain 1 day before the operation.

CASE 30. Age 43 married nineteen years, first pregnancy history of former pelvic peritonitis. Tubal pregnancy probably very early had ended period for only "few days." See also description of the pregnant tube. Operation six weeks after the onset of symptoms, suggesting the beginning termination of the pregnancy i. e., pain and uterine bleeding, flowing slightly the day of the operation. The termination as by tubal abortion and incomplete as chorionic villi were found in the tube. A hematocoele was found about the left tube, which was distended with blood clot 3 cm. in its greatest diameter. A gestation sac 1.5 cm. in diameter was found in the tube embryo not found but shadows of villi are present. Opposite tube and ovary bound down by old adhesions.

The arteries were injected with Venetian red and the veins with ultramarine blue. A small amount of the venous injection mass escaped into the uterine cavity. The uterus was slightly enlarged, to 5.5 x 3.8 cm. in the greatest transverse and anterior posterior diameters of the hardened specimen. The gross appearance of the injected uterus was negative, except for slight amount of the venous injection mass in the uterine cavity which arose from the endometrium. Some of the radial arteries showed slight degree of sclerosis.

The endometrium varied in thickness from 1 to 3 mm. Its surface was relatively smooth, covered with epithelium. The compact layer as decidua was but no decidua. The glands of the spongy layer were for the most part small, few were dilated, and stroma dense. The venous spaces in places were dilated. A few small arteries were seen in the base of the endometrium. The condition indicated subinvolution, the latter part of the regressive stage or beginning reparative stage.

CASE 30. Age 30, para, last uterine pregnancy year before. Tubal pregnancy probably was very early. See description of the pregnant tube. Operation forty five days after the onset of symptoms, suggesting the beginning termination of the pregnancy i. e., pain and uterine bleeding. The termination of the pregnancy was by rupture through the upper wall of the right tube about 1 cm. from the fertilized extremity. The tube was only slightly enlarged 1.5 cm. in its greatest diameter and its lumen was filled with clotted blood. The termination of the pregnancy is incomplete as chorionic villi are found in the tube.

The arteries were injected with Venetian red and the veins with ultramarine blue. A slight amount of the venous injection mass escaped into the uterine cavity. The uterus was enlarged to 6.4 x 3 cm. in the greatest transverse and anterior posterior

diameters of the hardened specimen. The gross appearance of the injected uterus was negative except for a very small amount of the venous injection mass in the uterine cavity. Some of the radial arteries showed a moderate degree of sclerosis. The endometrium (Fig. 27) varies from 3 to 4 mm. in thickness. Its surface was wavy and covered with epithelium, compact layer was edematous, no decidua. The glands were hypertrophied, some of the venous spaces dilated, a few small arteries were found in the base of the endometrium. The condition resembled the premenstrual stage of the endometrium *i. e.*, involution was complete.

CASE 21. Age 36, para, youngest sixteen years old, three years before the left tube and ovary had been removed for tubal pregnancy. Age of present tubal pregnancy probably six to eight weeks, the embryo, 4 cm. long, was found in the peritoneal cavity. Operation fifty-four days after the onset of symptoms, suggesting the beginning termination of the tubal pregnancy *i. e.* pain and uterine bleeding, flowing slightly at the time of the operation. Severe pain eleven days before. The termination of the tubal pregnancy was by tubal abortion and incomplete as chorionic villi were found in the blood clot in the tube. A hematocele was found about the right tube, which was enlarged to 3.5 cm. in its greatest diameter, the fetus, 4 cm. in length, was found in the blood clot outside the tube.

The arteries were injected with ultramarine blue and the veins with ultramarine blue. A small amount of the venous injection mass escaped into the uterine cavity. The uterus was enlarged to 6.5 x 5.5 in the greatest transverse and anterior posterior diameters of the hardened specimen. The radial arteries showed a moderate degree of sclerosis. The endometrium varied in thickness from 2 to 3 mm., irregular in outline, covered by epithelium. Compact layer absent, no decidua. Some of the glands were hypertrophied, arteries few in numbers, venous spaces dilated. The condition present was that of subinvolution, regressive stage.

CASE 2. Age 29, para (1) ten years before. Tubal pregnancy was early had not missed her menstrual period. See also description of tube. Operation eight weeks after the onset of symptoms, suggesting the beginning termination of the tubal pregnancy *viz.*, pain and uterine bleeding, slight flow at the time of the operation.

The termination of the pregnancy was by tubal abortion and incomplete. A hematocele was found about the right tube, the ampulla of which was distended by a blood clot 1 cm. in its greatest diameter. A few villi were found in the blood clot, the embryo was not found. The opposite tube was occluded.

The arteries were injected with ultramarine blue and the veins with bismuth. A small amount of the venous injection mass escaped into the uterine cavity. The uterus was slightly enlarged, to 5.3 x 4 cm. in the greatest transverse and anterior posterior diameters of the hardened specimen. Radiographs



Fig. 3. Arteriosclerosis, uterus of tubal pregnancy. First pregnancy. Photomicrograph (X 20) of a portion of the uterine wall. Vessel injected with bismuth. Operation seventy-two days after the beginning termination of the tubal pregnancy; incomplete tubal abortion (see Case 21). A greatly thickened artery can be seen in the center of the figure, difficult to detect from the surrounding myometrium. Venous spaces filled with the injection mass (black). Patient 36 years old first pregnancy. Involution had been going on for seventy-two days though delayed by the incomplete termination of the pregnancy. It is possible that the involution of ectopic pregnancy is associated with arteriosclerosis of the radial arteries as in uterine pregnancy.

of cross slices of the uterus showed the venous plexus of both the myometrium and endometrium to be well injected and dilated. There was a moderate degree of thickening of some of the radial arteries. The endometrium was thickened from 3 to 4 mm. and covered with epithelium. The compact layer was present, dense, no decidua. The majority of the glands of the spongy layer were of small size, a few were hypertrophied. A few arteries seen at the base, venous spaces in places dilated. The condition was that of involution, regressive stage.

CASE 3. Age 36 one miscarriage four years before (induced) pelvic peritonitis three years before. Tubal pregnancy was probably very early. See also description of the tube. Operation eight weeks after the onset of symptoms, *i. e.* pain and terine bleeding suggesting the termination of the pregnancy. The patient had had several hemorrhages from the rectum the first one five weeks before the operation and at operation the pregnant tube was found to communicate with the sigmoid. The termination of the pregnancy was by abortion through the fimbriated extremity of the left tube into the sigmoid. The tube was filled with

opinion. But such public opinion, in order to be effective must be intelligent and must be guided by the best scientific knowledge obtainable in order to arrive at correct conclusions and to act intelligently. Increasing knowledge of the cause of diseases, perfection of methods for their prevention as well as the recognition of the paramount importance of regulation of social conditions for such prevention make it necessary that there should be an educated public sentiment back of all of our effort for disease control. The real force in this country and the only effective force is public opinion. Laws are the crystallization of public opinion and not one of its formative influences. When this principle is fully recognized we will cease to advocate the adoption of mandatory laws without first creating a discriminating and intelligent public opinion on the necessity and importance of such regulation. If the education of the public is properly carried out the number of laws required will be greatly diminished and the effectiveness of those in force will be proportionately increased.

From the standpoint of the physician education of the public is necessary for effective work, as it is the duty of the medical profession to cure disease when it has actually occurred and to prevent disease wherever possible. As long as the causes of disease were unknown the physician needed only the cooperation of his individual patients. To-day my act may not harm me or my family but may bring disease and death to my neighbor while my neighbor's carelessness or lawlessness may be dangerous to me no matter how law-abiding I may be. The understanding and support of an intelligent public is to-day necessary in order that the physician may effectively carry on his work and fulfill his duty to his individual patients.

Public education regarding disease and its prevention being a necessity both from the public and professional standpoint, how is this to be secured and through what agencies is such education to be carried on? Obviously it should be so conducted as to reach the public through the most authoritative source possible through a medium that

will be recognized as representing the entire profession rather than any sections or portions thereof through a single agency rather than through many in order to avoid the confusion of the public mind which would result through a multitude of teachers. Practical conditions must also be considered. The expense and the labor required must be reduced to a minimum and each subject must be so presented as to be intelligible to the average reader and capable of public assimilation. The many important subjects must be presented in accordance with their relative importance. The public is not in a position to distinguish between theories in the form of working hypotheses on the one hand and demonstrated facts on the other hand neither is it in a position to reserve judgment on a scientific question pending the production of further evidence. It is essential that only demonstrated facts which have been accepted by practically the entire medical and scientific world should be presented to the public attention. Fads, hobbies, half baked theories, and fanciful hypotheses have no place in any scheme of public education. The recognized facts must be presented in language which is intelligible to the general public, and in a form which will be familiar. The facts must be presented in such a way as to show their practical importance rather than their abstract scientific value and without an effort to moralize each statement made must carry with it an implication of personal duty and responsibility on the part of the reader.

The necessity for public instruction on the prevention of disease has been recognized by practically all of our state boards of health and by many of our municipal health departments, as well as by the various federal bureaus working on public health and allied subjects. It has also been recognized by the organization of a large number of special voluntary societies, composed of those interested in some special problem and devoted to the arousing of public sentiment on this specific subject. Among such organizations may be mentioned the National Association for the Study and Prevention of Tuberculosis, the American Association for the Study

and Prevention of Infant Mortality The American Association for the Study of the Feeble Minded, The National Association for the Study of Epilepsy and The American Society on Sanitary and Moral Prophylaxis. In this class belongs the new organization already referred to — The American Society for the Control of Cancer

While the duty of the organized medical profession for the education of the public has long been recognized, and has led at different times to the appointment of special and temporary committees on various phases of the problem, it was not until three years ago that the considerations which I have discussed above led to the organization by the American Medical Association of a permanent board or council charged with the specific task of representing the medical profession of the United States before the public, with determining its relation with other public bodies, and with the education of the public on disease and its prevention.

In 1910, the American Medical Association provided for a Council on Health and Public Instruction, to be made up of five members. This Council now consists of Dr H B Favill of Chicago chairman Dr H M. Bracken, secretary of the Minnesota State Board of Health Dr W B Cannon, Harvard University Dr W C Woodward Health Officer of the District of Columbia, and Dr W S Rankin, secretary of the North Carolina State Board of Health, these gentlemen representing the philanthropic, scientific, and practical public health work of the Association. Recognizing the enormous importance of this new work, the unlimited field which presented itself and the need of laying a sound foundation for the future efforts to educate the public the Council has, in the last three years, devoted most careful consideration to the entire problem of the education of the public in preventable diseases. While carrying on these deliberations it was necessary to inaugurate some immediate work for the establishment of better relations between the medical profession and the public.

Recognizing the importance of newspapers as public educators and as molders of public opinion, one of the first activities established

by the Council was a press bureau. In July 1910 the press bureau was established, by which a weekly bulletin was prepared and sent to five thousand newspapers. This bulletin consisted of a clipping sheet, containing short paragraphs on public health topics of current interest which were specially prepared for insertion in the public press. Letters from editors and clippings from press bulletins combine to show the growing value of this educational feature and the increasing confidence of newspaper editors in the value of this propaganda and the disinterestedness of our motives. To-day it is possible through this medium to place in the hands of five thousand newspaper editors material which they recognize as authoritative, representative, and animated by unselfish motives.

The necessity of a single channel of communication with the press of the country is obvious. There is to-day in the United States a constantly growing group of organizations interested in some phase of the public health problem. While the very number is uncertain there are probably to-day nearly seventy-five such organizations. If each of these bodies attempted to maintain its own press service and to supply the newspapers of the country with material suitable for publication, not only would the expense and labor be duplicated seventy five times, but the newspapers of the country would be bewildered and confused by the mass of material sent them while the attempt to prepare separate bulletins on each specific subject would result in the elaboration of unimportant details and the production of an enormous amount of unnecessary material. The concentration of this material in a single bulletin, prepared specially for newspaper purposes, enables the newspaper editor to select those subjects which he regards as of importance or of special interest to his readers and to choose a variety of topics that would not be possible if the bulletin were devoted to the discussion of a single phase of the public health question.

The most important reason however why such matter should be sent out by the American Medical Association is that the Association is the owner of the largest and

most complete medical printing plant in the United States, if not in the world. Owing to the development of *The Journal of the American Medical Association* and its unparalleled business management during the last fifteen years, under the editorship of Dr. George H. Simmons, the Association to-day owns a large office building, with printing plant, office equipment and other facilities. The surplus earned by the *Journal* is distributed each year by the Board of trustees to the various boards and councils carrying on the Association work. The educational work of the Council on Health and Public Instruction is to-day made possible only by the earnings of the *Journal* which are practically the surplus of the dues and subscriptions of physicians after the expense of the *Journal* and the Association are paid.

As the Council is the representative of the Association and the profession before the public, this bulletin is open to anybody or any organization working for the education of the public on health topics. We have the means by which the newspapers and the public can be reached. The amount of suitable material which can be so circulated is practically unlimited. Any material furnished by societies or organizations will be thoroughly welcome and effectively utilized.

The next activity undertaken by the Council was the organization of a speakers bureau. Two hundred of the leaders of the profession in various parts of the country were asked to contribute their services to the extent of giving from six to eight addresses a year before meetings arranged by local organizations under the auspices of the speakers bureau. One hundred and thirty five accepted. Announcements of the bureau giving the names of the speakers, the subjects, and conditions under which they could be secured were sent to the secretaries of medical societies, women's clubs, universities, teachers institutes, farmers institutes and other local organizations. In the case of appointments made through the bureau the speaker donates his time, the Council pays the traveling expenses of the speaker

and the local organization provides the meeting-place and advertises the meeting. In this way by a division of expenses, the burden does not fall heavily on any one, and any city or town in which the local organization will unite for a meeting on public health can be given a speaker of high scientific ability to deliver an address on a suitable health topic.

Last year speakers were furnished for over 350 meetings between November 1, 1912 and June 1, 1913. This year over fifteen thousand announcements have been sent out, and the work of the speakers bureau continues to grow in importance with each year. Here again the work of this bureau is at the service of any organization desiring to avail itself of the bureau's assistance. Speakers can be secured for addresses on infant mortality, medical school inspection, pure water, pure food or any other subject that may at the time engage the attention of the community. Additional speakers on any important subject will be welcomed. Any local organization can arrange for a public meeting and secure a speaker. The funds at the disposal of the speakers bureau, while not unlimited, are ample to meet all demands for the present.

The next activity of the Council was the organization of a bureau of literature. Series of pamphlets on the most important subjects have been or are being prepared for distribution to those interested. Pamphlets for the protection of medical research; the conservation of vision on general health topics, and on medico-legal and legislative questions have been prepared. Several other series are now in process of development. A single pamphlet or a series of pamphlets on cancer and its prevention can be issued by the Council without expense provided the right kind of material can be secured.

Other plans for future development involve a lantern-slide loan bureau, a bureau of exhibits and charts and other methods for public education.

While inaugurating these methods at once in the immediate education of the public, the most important and fundamental work of the Council at present is the investigation

of the public health situation in the United States. In addition to carrying on the activities mentioned above, the work to which the Council has decided to devote itself during the coming year is the preparation of a report on public health activities in the United States, considered under four heads, namely Federal health activities, state health activities, municipal health activities, and private organizations. We hope to publish, by the end of the coming year, a report showing exactly what the federal government is doing for public health and what other national governments are doing by way of comparison, what the various state boards of health are actually doing as shown by a personal survey, by a competent authority, what is being accomplished by state boards of health and how much it is costing, what is being accomplished by municipal departments of health and what it is costing, what is being done by voluntary organizations, and what duplications and overlapping exist who is paying the expenses of these organizations, what the total cost is, and what is being accomplished in proportion to the cost. Such a survey of the entire public health problem in this country has never been undertaken. When completed, it will shed light on the subject and will serve as a basis for future plans.

In addition, the Council has established a medico-legal bureau, in charge of a competent attorney in which is being taken up the study of legislative conditions and public health legislation throughout the United States, with a view to formulating model laws on the most important subjects relating to public health and so guiding public health legislation in the most productive channels necessary without crowding our statute books with innumerable unenforceable laws.

Such being the general plan of the Council, the question now recurs as to the specific problem of public health education on cancer. What can the Council on Health and Public Instruction of the American Medical Association do to enlighten the public on this subject? The answer is obvious. We are in place at the disposal of the American Society

for the Control of Cancer and the Committee of the Clinical Congress of Surgeons of North America, all of the resources of the Council on Public Health Education. Through the press bulletin, suitable material on this subject can be placed in the hands of five thousand editors without any cost to the Society or the committee. Through the speakers bureau, addresses can be given to the public on cancer and its menace. Through the bureau of literature, local pamphlets and leaflets on this subject can be distributed. Later on, through the lantern-slide bureau and the bureau of exhibits, material on cancer and its control can be placed before the public. The agencies at work on this problem at present are the American Society for the Control of Cancer, the Committee of the Clinical Congress of Surgeons of North America, and the Council on Health and Public Instruction of the American Medical Association.

The work which needs to be done seems also to be threefold and to be peculiarly adapted to these three organizations. The first thing is to interest the public, and especially the wealthy and influential public, in the problem of the control of cancer. This is a movement for the public welfare, and there is no reason why the public should not assume part of the expense. This is the work for which the recently organized Society for the Control of Cancer is admirably adapted.

The second necessity is the careful investigation of the entire problem of cancer, its age, race, and sex incidence, its relative frequency in different occupations and locations, and all of the clinical facts connected with its appearance. There is to-day in the records of our different hospitals throughout the country an enormous mass of undigested material on this subject. This is clearly a clinical and surgical problem.

The third requirement is the distribution to the public of the results of such an investigation. This is obviously a task for the Council on Health and Public Instruction of the American Medical Association, representing as it does the organized profession of the entire country. Through its machinery it can without any additional expense place

before the public any information which may be desired on this question.

The division of work which suggests itself to the careful student of the situation is this: Let the American Society for the Control of Cancer devote itself to interesting the public, especially the wealthy and influential women of our country in the importance of the campaign against cancer and the necessity for personal support. Let the Committee of the Clinical Congress of Surgeons of North America take up the clinical side of the problem and the collection of data based

on the clinical records of our hospitals. Let the Council on Health and Public Instruction of the American Medical Association, through its press bureau, its speakers bureau, its pamphlets, and other agencies, place before the public the facts on this subject as an authoritative utterance of the organized medical profession of the United States. Such a program is concise, definite, and practical, and insures the co-operation of all forces in the field in the solution of the problem, and the control, or at least the marked reduction, of cancer in America.

CONGENITAL PYLORIC STENOSIS

By ROLAND HILL, M. D. C. M. SAINT LOUIS

RECENT studies of congenital pyloric stenosis have shown it to be a disease of much importance. Until the past few years these cases were treated as cases of marasmus, and the true pathology of the condition remained an unknown factor.

The frequency of occurrence of this condition is hard to estimate as the statistics on this point are very meagre, but observations made at the Bethesda Hospital by Dr. T. Wistar White of St. Louis, showed five cases originating in one thousand babies. This estimate of one case in every two hundred babies seems to be fairly accurate as to the frequency of the disease.

The pathology of the condition consists primarily of great enlargement and thickening of the pylorus, caused by hypertrophy of the circular muscle. This causes an obstruction of the pyloric opening that may be more or less complete. The enlargement is about the size of the last joint of the thumb, is smooth, non-adherent, and usually can be palpated through the abdomen. The stomach becomes very much enlarged, and the intestines small and shriveled.

Scudder holds that the obstruction is an anatomic one and not dependent upon physiologic causes. Its cause is unknown, but the heredity factor seems to be prominent,

as two of our cases occurred in families where the condition had occurred before.

The age at onset of the symptoms of this disease is usually between the third and sixth week of life. The symptoms vary according to the degree of obstruction, and it seems certain that conditions exist varying from slight obstruction (the spasmodic type) to complete obstruction where a fine probe can hardly be pushed through the pyloric opening. Usually we have in these cases a history of a normal child until it is between three and six weeks old, when the manifestations make their appearance.

The symptoms of the disease may be considered under four heads: 1. Vomiting. 2. Constipation. 3. The gastric waves of contractions. 4. Tumor. The first symptom to attract attention is the vomiting. At first this is hardly sufficient to demand special attention, and may be temporarily improved with a change of food. Any improvement, however, will be temporary and the vomiting soon becomes more aggravated than ever. The vomiting is distinctly projectile. The propulsive force is at times so great that a child of three months, lying on its side, has been seen to eject the contents of the stomach a distance of three feet. Occasionally the child may not vomit for several minutes after

taking food. In the latter stages of a severe case he ejects a part or all of every feeding.

The loss of weight is very rapid. The constipation is most marked and in severe cases may be practically absolute. Mucus alone may be found in the stools. The urine is scanty and dark in color. The appearance of the child is like that in marasmus. The face is wrinkled and the tongue and the mouth dry.

On inspection the upper part of the abdomen is found to be enlarged and the lower part narrow and empty. The outline of the stomach can frequently be seen reaching as low as the umbilicus, and on palpation gives a sense of muscular resistance greater than that of a distended colon. The muscular or gastric waves soon make their appearance. These are pathognomonic of the condition. These waves are due to peristaltic contractions of the gastric muscle. These contractions may manifest themselves in a rounded eminence rising at the left costo-chondral border where it remains a short time. Usually however they manifest themselves in waves passing across the epigastrium and disappearing on the right side. Sometimes three such waves are in sight at one time. They are rarely more than one inch in height. As a rule the waves occur after taking food but may often be brought on by irritating the skin of the abdomen in the gastric region.

The enlarged pylorus may readily be palpated in the disease. It occurs as a smooth rounded mass about the size of the end of the thumb.

The diagnosis in a typical case is easily made, as the presence of tumor, the gastric waves, the malignant vomiting so to speak, and the marked constipation make the picture clear. The presence of enteritis and also of brain lesions in their early stages may tend to obscure the diagnosis. In the early stages the passage of a tube and recovery of retained milk is a valuable diagnostic aid.

The treatment of congenital pyloric stenosis may be considered under two heads: 1. Medical 2. Surgical. In all our cases medical treatment had been thoroughly tried, and in several it had been persisted in so long that surgical measures offered only a long chance. Two cases coming in the past year were con-

sidered so hopeless that after being admitted to the hospital the pediatrician in charge considered it useless to seek surgical relief and they died in a few days after admission.

The medical treatment consists in feeding by a tube. The stomach is washed out and the food inserted through the tube. Children will often retain food given in this way in the spasmodic cases where they will eject it if swallowed. In some of these cases nutrient enemata of whey or other foods give temporary relief.

The question of when to operate in these cases is a vital one. Scudder states that an operation is indicated in all cases where a distinct tumor is palpable and also in those cases of spasmodic variety where, under medical conditions and treatment, conditions become very grave. Lowenburg states that in determining whether or not to operate in these conditions we have three factors of importance to consider: 1. Weight 2. Strength 3. Character of the constipation. He gives the following rule: If a small amount of food is retained and the weight remains stationary or there is a slight weekly gain or if the strength does not seem to be ebbing away and if with this we have an occasional large bowel movement, we are justified in waiting even if vomiting persists. If no food or very little food is retained with loss of weight and increasing constipation, patient should be operated upon before he becomes too weak.

When these cases are studied from a surgical standpoint, there are several important factors to be considered. Infants stand the shock of operations badly. They are prone to infection and the reparative power is so slight that the wounds may simply fall apart when one would expect them to be thoroughly healed. The operations recommended in these conditions are Loret's operation or division of the pylorus, gastroduodenostomy or pyloroplasty and gastrojejunostomy. The first two of these operations have almost been discarded as being far inferior to the posterior gastroenterostomy.

Several points regarding the preparation and operation are worthy of note. None of the very strong antiseptics have been used in our cases simply thorough cleansing with

soap sterile water and alcohol. Ether is the anesthetic of choice with babies, and a trunk of oxygen should be available. The incision is best made to the left of the median line and rather low because of the large size of the liver. The usual Mayo-Moyamabahn operation is done. In the infant, however several points are to be carefully observed. The bowel is about three-eighths of an inch in diameter and is so fragile that the least undue tension will cause the stitches to tear through like tissue paper. The finest needles and suture material are to be employed. Fine chromic catgut may be used for the inner layer of sutures but I think fine silk about 00 in a No. 10 milliner's needle will be found the most suitable. The bowel is usually so shrunken that every care must be taken to avoid a kink. A kink caused the death of my second case.

The results obtained by treating these cases surgically were at first anything but satisfactory but increasing experience earlier recognition by the pediatrician, and operative intervention before the vital powers of the child too far exhausted, has led to some most brilliant results in this comparatively new field. One author reports that the statistics collected from 1898 to 1905 showed a mortality of 46.05 per cent. Haines of Cincinnati analyzed the records of 129 cases. In this series division of the pylorus was done twenty-nine times with fourteen recoveries. Mortality 51.07 per cent. Gastro-enterostomy seventy six cases with thirty five recoveries. Mortality 52.1 per cent. Pylorotomy in one case with a fatal result. F. S. Bunte, Cleveland, reports seven cases with four recoveries—all operations performed by anterior gastro-enterostomy. Statistics by Scudder show that he has performed fourteen of these operations with one death. Richter of Chicago reports twenty one cases operated upon with only three deaths, while Stillman of San Francisco reports a group of ten cases operated upon with only one death.

The cases of congenital pyloric stenosis that have been referred to me for operation have all come from pediatricians of broad experience who draw their work not only from

St. Louis, but from a large surrounding territory. I have operated upon ten of these cases—five have recovered and five died. This high mortality is due to two factors—faulty technique in one perhaps two of my early cases and almost hopeless complications in the other three. One had a meningitis develop a couple of days after operation, and two had intense jaundice at the time. The jaundice cases acted peculiarly. One lived eleven days and the other five days. Both died in the same way from the tissues simply falling apart, as nature had not made any efforts at repair.

1. Detailed histories of my cases are as follows:

CASE. My first case is that of H. W. F. Jr., born September 14, 1911 weight 8 pounds. The child was breast fed and seemed to get along well until fourteen days old, when he cried and vomited after each feeding. The attending physician said it was indigestion and had him taken off of breast milk and put on barley water, rice water and albumen water in succession with no result.

Child continued to vomit his bowels had not moved except with the aid of castor oil or an enema, when the movement was black and scanty containing great deal of mucus. The condition gradually became more aggravated until October 10th, when posterior gastro-enterostomy was performed. At the time of the operation the weight was 6 pounds and 3 ounces.

The child improved immediately and the second week gained pound. At six months he weighed 3 pounds and at seven months, 13½ pounds. At one year his weight was 20 pounds at two years, 26 pounds. He seems to be as strong and active as any other child.

CASE. Virginia S., born November 26, 1911. Parents healthy. The parents have one child living, four years old. Two years ago a baby died of symptoms identical with the present case. Apparently healthy at birth. It thrived until three weeks old when vomiting began, and death occurred when six weeks old. A diagnosis was made.

Present case. The child was normal at birth. There was no more spitting up than in any ordinary baby until December 2d, when four weeks old. December 5th, parents became alarmed at severity of vomiting. As described by mother. The vomiting was violent and often was greater in quantity than previous feeding. Baby was in poor condition, prostration, slight fever, peristalsis of stomach visible and tumor palpable.

The child was removed to the Bethesda Hospital and lavage begun. The vomiting decreased, but a large proportion of food was retained in the stomach and removed by washing. The child gradually

became worse and operation was decided upon. A posterior gastro-enterostomy was performed December 30th. At this time the weight was 6 pounds and 14 ounces.

This failed to give relief and obstruction was feared, and abdomen reopened in 36 hours. A kink was found in the jejunum owing to a misplaced suture. The baby died January 2d.

CASE 3. C. O. born March 28, 1912. The family history is uninteresting except that this is the sixth child in the family five of whom are living. One child died ten years ago at the age of six weeks. It was a healthy baby at birth and did well for two weeks, when it was taken with vomiting and died of inanition after four weeks illness. This was probably case of pyloric stenosis.

The history of the present case is that the baby, born March 28th, weighed ten pounds. She did well for three weeks, but on April 8th was taken with severe vomiting, bowels moved frequently and movements were very scant. A tumor could be palpated at pyloric region and muscular peristalsis was visible.

The child was breast fed until April 23d, when Eskey's food was tried. She retained several feedings the first day and also some the second day. April 24th, April 25th vomiting was most persistent and weakening. April 26th temperature was 99.5°. Dr. Samuels saw the case at this time and started lavage and feeding with peptonized milk. In the first twenty-four hours of this treatment 3/4 ounces were retained, next twenty-four hours 7/4 ounces were retained. After that not more than one-half ounce of each feeding retained.

Child lost very rapidly April 2d when sick four days. Weight was 43 April 8th 9. April 10th, 8.5, showing a loss of weight of one pound and nine ounces in thirty-six hours. The temperature was normal from April 8th, when sickness commenced, until April 26th. It then went up to 103 and continued to run 100-103 until after operation.

Operation. Posterior gastro-enterostomy performed April 26th, 5 P. M. The patient was treated with bismuth and lavage. After midnight mother's milk was given and child began to retain it. Following this there was rapid recovery. The child took the bottle in four days, vomiting gradually subsided, stools increased in amount and the temperature became normal in five days the decline being gradual. At the end of the first week it was found that the child had gained three ounces. During the second week she gained six ounces. From this on, recovery was very rapid. On December 9, 1913, the mother reported the child weighing 5 pounds at 30 months. Child is extremely active and enjoys splendid health.

CASE 4. Chas. G. L. male child born May 10th, 1914, 8 1/2 pounds. The child was normal, except for a slight jaundice until May 26th when the characteristic signs of pyloric stenosis developed. The vomiting was projectile constipation marked gastric waves prominent and tumor palpable.

The loss in weight was rapid. Jaundice was very marked. Patient referred for operation. Posterior gastro-enterostomy performed June 1, 1915. Its weight at the time was 5 pounds. Child did well for a week and then developed convulsions and died June 1, 1915.

Examination showed that the tissues had simply fallen apart both at the new opening and the abdominal wound.

CASE 5. Helen W. born June 24, 1911. The child was normal for five weeks when the characteristic symptoms of pyloric stenosis manifested themselves. Tumor palpable. Weight when admitted to the hospital, 6 pounds, 7 ounces, July 9.

Posterior gastro-enterostomy performed. Feeding in one drachm doses began six hours after operation. This amount was rapidly increased. The baby did well and was discharged cured August 10th.

CASE 6. J. E. N. born June 5, 1912 weight 8 pounds. The child was normal until July 21st, when the characteristic vomiting, gastric waves, and constipation made manifest. A tumor could not be palpated. The loss of weight was rapid. Severe jaundice existed as complication.

Posterior gastro-enterostomy performed July 28th weight at time, 5 pounds. The child did badly after the operation, and died August 1st. In this case the wound simply fell apart. This falling apart of the wound characterized both of the cases in which jaundice existed as the reparative power seemed to be absolutely lacking. This was a case of the spasmodic type as the pylorus was very little thickened and the opening was adequate.

CASE 7. Henrietta L. C. of Fort Smith, Ark., was born July 24, 1911. At birth he weighed eight pounds. Her weight increased to 1 3/4 pounds, and child was normal until she was between four and five weeks old, when the projectile vomiting and other signs of pyloric stenosis developed. Loss of weight was gradual. She was brought to St. Louis for operation October 4, 1913. Tumor was well marked and emaciation was extreme. The child was then ten weeks old, and weighed five and three-fourth pounds.

Posterior gastro-enterostomy was performed. Anesthetic, ether. Child fed on mother's milk. It never vomited after the operation. Gained eleven pounds in the next twelve weeks. On December 6, 1913 the father reported the child in perfect health and weighing twenty-four pounds.

CASE 8. N. B. was referred for operation April 8, 1913, at the age of four months. The early history was not obtainable. The meager history given was that symptoms of pyloric stenosis had developed at the age of six weeks and had been persistent although a tumor was not palpable. When referred for operation the child had running ear and a temperature of 100. Its weight at the time was 5 pounds 5 ounces.

Posterior gastro-enterostomy was performed and the child did well for three days and then developed meningitis from which it died the end of a week.

This case was simply one of spasm of the pylorus and true stenosis did not exist. Examination of the cerebrospinal fluid showed that the case was simply one of meningitis from the ear infection.

CASE 9. Herbert H., born June 5, 93 weight 9 pounds. This increased to 13½ pounds by the first of July. July 6th, commenced to have the characteristic vomiting of pyloric stenosis. This was accompanied by the other characteristic signs, including tumor. The loss of weight was rapid. From July 8th to 11th, the child lost 1½ pounds. Conditions became gradually worse until July 16th, when child weighed 5 pounds 8 ounces. Conditions were so grave that it was thought if gastro-enterostomy were attempted the child would die on the table. In this case division of the pylorus was done by means of a forcep passed through small opening in the stomach. The pyloric muscle could be felt to give way. Four ounces of water were inserted into the bowel by means of catheter passed through the pylorus. Conditions improved for the next few days then the child became worse and died August 3 1913. The abdominal wound simply fell apart, and it was found that the pylorus had contracted down again.

CASE 10. Maflory P. a twin born October 1 93. The child was premature and at birth weighed only 4 pounds and ounces. Friday November 15th, the severe vomiting commenced and the gastric waves became prominent. Constipation almost absolute. A tumor was palpable. Operated, November 14, 93. Child at the time was pulseless at the wrist and had been so for more than 24 hours. Its weight was 3 pounds and 5 ounces. Its temperature was subnormal. Posterior gastro-enterostomy performed. Next day and for several days following he had several mild convulsions, would occasionally cry out with pain, but for the most part was perfectly still, eyes partly open, and unable to swallow. All food was given through a tube, beginning with few drachms of water almost immediately after operation (within two hours). Mother's milk was given next day at first one-half ounce every two hours, and increased to one ounce. One-half ounce of water with three per cent cane sugar was given the alternate hour. Practically all vomiting ceased, and stools became normal. It was ten days before the child could swallow and more than a week before it could close its eyes. Gain in weight was slow only about three ounces the first two weeks. After this the child began to improve rapidly. It gained four and one-half ounces the third week, twelve and one-half ounces the fourth week. The fifth week the gain was one pound for the week.

This is the smallest child of which I can find any record of having been successfully operated upon for this disease.

In conclusion I wish to add that all of the cases submitted to operation should be fed upon mother's milk. They should have the care of a nurse thoroughly trained in pediatrics, and a pediatrician should have charge of the feeding. These things are, I believe, absolutely necessary if the best results are to be obtained. In regard to the application of surgery to these cases, I believe I am justified in saying that the operation is justifiable if it can be shown, first, that a tumor is present; second that the operative treatment is attended with a mortality as low or lower than the medical treatment by lavage and diet; third, if with an equal or lower mortality it can be shown that surgery gives immediate results and saves parents the prolonged suspense of doubtful treatment that may demand operative relief in the end.

In regard to the mortality in these cases, it was high in the early series of cases in the hands of different operators. With an increased experience, however, it has come down until it is lower than medical treatment in the most skillful hands.

The second point is easily answered.

In the doubtful cases treated by lavage, the outcome is in doubt for several weeks at least the treatment is nerve-wrecking and the outcome uncertain.

Surgery on the other hand, yields results almost instantaneous, and a child that to-day is crying, vomiting all nourishment and the picture of marasmus, may in a week's time present a condition of rapid convalescence and contentment.

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OPERATIVE TREATMENT FOR MALFORMATIONS OF UTERUS AND VAGINA¹

B. J. M. MUNRO KERR, M.D. GLASGOW SCOTLAND

Malshand Professor of Obstetrics and Gynaecology Glasgow University Gynaecological Surgeon, Royal Infirmary; Hon. Fellow, American Gynaecological Society

ALTHOUGH gynecological surgeons frequently encounter malformation of the reproductive organs for they are much more frequent than the general medical public suspect there are singularly few contributions to the surgery of such malformations. There are, of course many contributions relative to individual varieties but with the exception of Goullcound these "Du Traitement des malformations utérines justifiables de la laparotomie" I can find few contributions which deal with the subject in general.

The time, therefore, has come when we should consider a little more than we have done in the past how these malformations may be remedied or improved.

I propose to consider malformation under the following heads:

A. Where fusion of the Mullerian ducts has occurred, but development of the uterus has been arrested.

B. Where the Mullerian ducts are fused but the two halves of the uterus are divided by a more or less complete septum.

C. Where the two Mullerian ducts are more or less imperfectly fused.

D. Where the deformity affects the vagina more especially.

A. WHERE FUSION OF THE MULLERIAN DUCTS HAS OCCURRED BUT DEVELOPMENT OF THE UTERUS HAS BEEN ARRESTED

Infantile uterus In the simplest of all malformations, the infantile uterus, I have never been able to secure a satisfactory menstruation nor have I ever seen a pregnancy occur. I have sometimes seen a small uterus respond to such local treatment as dilatation, electricity repeated curettage etc. and a more satisfactory menstruation and

even a pregnancy occur but the true infantile uterus is, in my experience a hopeless organ to remedy. In many cases it is even worse than that, for it is frequently the cause of great discomfort to the possessor. We are familiar with the extreme dysmenorrhoea frequently associated with the condition and which in former years led surgeons to remove the ovaries, but which is now rightly dealt with by hysterectomy.

Uterus foetalis In the more extreme varieties, such as the uterus foetalis, menstruation is generally absent. If present it is late in making its appearance only occasionally occurs and is very scanty. It is often associated with dysmenorrhoea, but in several cases which I have had under my care there was no dysmenorrhoea or menstrual discharge. I have seen the condition in women of specially good physique as well as in women delicate, small and ill-developed. The external genitalia and the ovaries are generally poorly developed. Nothing can be done for such cases but operative interference is only indicated when extreme dysmenorrhoea is affecting the general comfort and health of the individual, and here again total hysterectomy is preferable to oophorectomy.

Uterus rudimentarius A more pronounced degree of malformation in which the uterus is rudimentary — uterus rudimentarius (en cavatus or solidus) — is an error of development of a much earlier date. In this variety the uterus is small generally with a single small cervix and two elongated tubular bodies in extreme cases there may be no cervix. In this variety of malformation the more rudimentary the uterus the less likely is there to be any pain and discomfort of a periodic nature, but in some cases, both where the tubular bodies are solid and where they are canalized, severe periodic pain has necessitated complete removal. In two cases recently examined the women were well de-

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¹Ann. de Gynec. 1911, Oct. Nov. Dec.

Read before the Obstetrical and Gynecological Sections of the International Congress, London, August 1913.

veloped and with good-sized breasts. The vagina is often absent or if present is small. In one or two cases the glands have been well developed testicles and not ovaries. A case recently operated upon by Russell Andrews was of this nature, and yet the individual appeared to be a well-developed woman. This fact is peculiarly interesting in connection with the internal secretions and the influence these have upon the growth and development of the individual.

Here again nothing can be done for the condition in the way of making a healthy functioning organ but when the vagina is absent a canal may be artificially made. We shall refer to this later when speaking of malformation of the vagina.

Atresia cervicalis From the infantile uterus with its subdivisions we naturally pass to the cases in which the cervical canal is obliterated in its whole extent or at the site of the internal or external os.

Patients with these conditions may suffer no discomfort if there is no menstrual accumulation (hematometra) or if there is no periodic uterine contractions, but they will suffer pain if a menstrual discharge gets pent up with the formation of a hematometra or if there is active uterine contraction of a periodic character.

In dealing with such cases surgically it is obvious that little benefit will be secured by establishing a cervical canal if there is no evidence of periodic pain or uterine hemorrhage for the women are hopelessly sterile. But, on the other hand if there is evidence of an accumulation of blood in the uterus some plastic operation on the cervix may result in the relief of the periodic pain by allowing a free escape of menstrual blood. In a few cases pregnancy even may occur. Naturally the best results will be secured in those cases where the atresia is located to the internal or external os. In the cases where plastic operations are impossible hysterectomy offers the only cure.

Atresia of internal os We are all familiar with stenosis of the internal os — with those cases in which the sound passes readily through the cervix until it reaches the internal os, and where, with little force, we manage

to get it pushed through and kept patent by repeated dilatation or a stem pessary. Personally I have not encountered a case where there was absolute obstruction limited to the internal os, and so I think it must be very rare indeed.

In dealing with cases of genuine atresia of internal os, different methods may be employed. A common practice was to force a passage with sound or metrotonus and keep it patent by means of a stem pessary. But surely with our present surgical knowledge such a method is crude.

A very ingenious suggestion is the one made and actually employed by Goulcoud and termed by him *trachelostomie*.¹ It is performed as follows: The abdomen having been opened and the bladder pushed down, the uterus is split up the middle line. The obstructing tissue at the os internum is then excised the uterine and cervical edges of mucous membrane are stitched, and a size placed in the cervix. Finally the two edges of the uterine wound are stitched together. The illustration explains the manner in which the operation is performed.

Goulcoud mentions a case reported by Engstrom² where the latter opened the uterus and established a canal, dilated it and pushed down a piece of gauze through it into the vagina. One tube distended with tea colored fluid was removed.

Personally I think where there is any thickness of tissue it would be better to push the bladder well off the cervix and excise, by transverse incisions, the obstructing ring of tissue. Finally an end-to-end anastomosis of cervix to body should be made much in the same manner as that suggested by Mayo³ for dealing with myomata of the cervix.

One thing, however is of prime importance and that is to open the abdomen in the first instance in all the more complicated cases of atresia of vagina or cervix. In reading over the literature of the subject one is struck by the frequent disasters which have followed dissections and tappings from the vagina. Most recent papers as, for example, those of

¹Zentralbl. f. Gynäk., 1896, p. 971.
²Bull. Gynec. & Obst., Feb., 1901, p. 2009. Ann. de Gyn. Obs.
³1901.

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Atresia of external os We are all familiar with this condition in obstetrical practice and have dealt with it by making a crucial incision when the cervix was obliterated and the presenting head stretched the cervical canal. Some of us have seen the uterine contractions overcome the obstruction and carry away part of the thinned-out portio vaginalis. In gynecological practice, however it is not common to encounter it and very difficult to distinguish it from a cervix completely obliterated. When the condition is suspected and a hematometra exists a trochar and cannula may be employed with great care and the portio punctured at its apex. If the accumulation of blood is readily reached one will conclude that only the region of the internal os is obliterated but if the hematometra cannot be tapped or only tapped with great difficulty one concludes that the whole canal of the cervix is atresic. Where an atresia exists only in the neighborhood of the external os and a good-sized trochar has been inserted the operator should cut a circular wedge from the lowermost portion of the cervix and unite the mucous membrane of the canal with the mucous membrane of the vaginal surface of the portio.

Atresia of the whole cervical canal In this condition our difficulties in establishing a satisfactory canal are much greater. This is especially the case in this variety because the upper part of the vagina is often atresic. The older methods were to attempt to establish a communication by knife trochar and cannula from below. This as I have said before, is crude, and as the recorded cases show is attended with great danger to the patient.

A somewhat safer proceeding was that adopted by Ludwig³ in a case of hematometra with a non-canalized cervix. He opened the abdomen and found no distention of the tubes, only some free blood in the pouch of Douglas. He then opened the uterus and pushed a trochar and cannula through from the

uterus into the vagina. In criticizing the proceeding Wertheim mentioned a case where he had established a fistulous opening between the lower part of the body and the vagina by suturing the uterine body to vagina (ventrofixation). A somewhat similar proceeding was adopted by Halban who fixed the fundus to the vagina.

It is not surprising that operators in recent years should have been abandoning such crude methods and should have been attempting to establish a permanently patent canal by removing the intervening tissue and resecting and uniting the two ends by means of sutures. As we shall see when atresia of the vagina is under consideration this method of dealing with gynatresia is not difficult when the atresia is confined to the lower third of the vagina or where the obstruction involves only a small portion of the cervix and vault of the vagina. But if there is a considerable portion of tissue intervening involving cervix and upper third of vagina it is extremely difficult to establish an end-to-end anastomosis and a satisfactory utero-vaginal canal. This was well seen in the case recorded by Cohn. Cohn failed to establish this union of the two ends and was finally compelled to perform hysterectomy. With but doubt the ideal procedure is to open the abdomen, examine the adnexa, and separate off the bladder until the vaginal rudiment is reached. This is infinitely safer and more surgical than dissecting one's way up from below without knowing what is the condition of the adnexa.

B WHERE THERE IS FUSION OF THE TWO HALVES OF THE UTERUS BUT A MORE OR LESS COMPLETE SEPTUM DIVIDES THEM.

1 *Septum complete.* (Uterus septus or uterus bilocularis.) In this variety of malformation there appears to be little disturbance of general health or menstruation unless there is atresia of one cervix. Hematometra in this variety is very rare. Parturition too is frequently easy although by no means always so.

¹ Pöhl. *Zeitschr. der Geburtsh. u. Gynäk.* 1900.
² Zentrbl. f. Gynäk., 1904, p. 503.
³ Zentrbl. f. Gynäk., 1900, p. 85.

¹ Zeitschr. Geb. u. Gynäk., 1900, also,
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Atresia of external os We are all familiar with this condition in obstetrical practice and have dealt with it by making a crucial incision when the cervix was obliterated and the presenting head stretched the cervical canal. Some of us have seen the uterine contractions overcome the obstruction and carry away part of the thinned-out portio vaginalis. In gynecological practice however it is not common to encounter it and very difficult to distinguish it from a cervix completely obliterated. When the condition is suspected and a hematometra exists a trochar and cannula may be employed with great care and the portio punctured at its apex. If the accumulation of blood is readily reached one will conclude that only the region of the internal os is obliterated, but if the hematometra cannot be tapped, or only tapped with great difficulty one concludes that the whole canal of the cervix is atresic. Where an atresia exists only in the neighborhood of the external os and a good-sized trochar has been inserted, the operator should cut a circular wedge from the lowermost portion of the cervix and unite the mucous membrane of the canal with the mucous membrane of the vaginal surface of the portio.

Atresia of the whole cervical canal In this condition our difficulties in establishing a satisfactory canal are much greater. This is especially the case in this variety because the upper part of the vagina is often atresic. The older methods were to attempt to establish a communication by knife, trochar and cannula from below. This, as I have said before, is crude, and as the recorded cases show is attended with great danger to the patient.

A somewhat safer proceeding was that adopted by Ludwig³ in a case of hematometra with a non-canalized cervix. He opened the abdomen and found no distention of the tubes, only some free blood in the pouch of Douglas. He then opened the uterus and pushed a trochar and cannula through from the

uterus into the vagina. In criticizing the proceeding Wertheim mentioned a case where he had established a fistulous opening between the lower part of the body and the vagina by suturing the uterine body to vagina (ventrofixation). A somewhat similar proceeding was adopted by Halban⁴ who fixed the fundus to the vagina.

It is not surprising that operators in recent years should have been abandoning such crude methods and should have been attempting to establish a permanently patent canal by removing the intervening tissue and resecting and uniting the two ends by means of sutures. As we shall see when atresia of the vagina is under consideration this method of dealing with gynatresia is not difficult when the atresia is confined to the lower third of the vagina or where the obstruction involves only a small portion of the cervix and vault of the vagina. But if there is a considerable portion of tissue intervening involving cervix and upper third of vagina it is extremely difficult to establish an end-to-end anastomosis and a satisfactory utero-vaginal canal. This was well seen in the case recorded by Cohn. Cohn failed to establish this union of the two ends and was finally compelled to perform hysterectomy. With but doubt the ideal procedure is to open the abdomen, examine the adnexa, and separate off the bladder until the vaginal rudiment is reached. This is infinitely safer and more surgical than dissecting one's way up from below without knowing what is the condition of the adnexa.

B WHERE THERE IS FUSION OF THE TWO HALVES OF THE UTERUS BUT A MORE OR LESS COMPLETE SEPTUM DIVIDES THEM.

1 *Septum complete* (Uterus septus or uterus bilocularis.) In this variety of malformation there appears to be little disturbance of general health or menstruation unless there is atresia of one cervix. Hematometra in this variety is very rare. Parturition too is frequently easy although by no means always so.

¹ *Prakt. Ergeb. der Gynäk.*, 2. Oryth., 1905.

² *Zentralbl. f. Gynäk.*, 1901, p. 205.

³ *Zentralbl. f. Gynäk.*, 1900, p. 453.

⁴ *Zeitsch. Geb. Gynäk.*, 1900, 212.

⁵ *Zentralbl. f. Gynäk.*, 1901, p. 395.

A very striking example of dystocia caused by this malformation is the one recently described by Bethin where cesarean section was necessary. The author in his paper is more concerned in discussing the advantages of cervical cesarean section than in considering the most suitable operation for this particular malformation. We are inclined to think from the description of the case and the illustrations which accompany his most interesting paper that the operator might have employed a median longitudinal incision, and removed the whole septum after extracting the child.

The most natural course to pursue in cases of this nature which call for operative interference during pregnancy and parturition is obviously removal of the septum after splitting open the uterus. From recorded cases we are quite convinced this might generally be done without much difficulty.

As regards the non-gravid uterus matters are quite different. We believe that in these cases the septum can best be reached and removed in the following manner. Open the abdomen and examine the uterus and adnexa. Then make a transverse incision across the uterus at the lowermost part of the body. Just divide the uterus to about the extent of two-thirds, turn back the two halves of the uterus, and by that means one can readily reach the septum of body and cervix and remove it with scissors. Pack some ribbon gauze into uterine body and push down the end through cervix. Then suture divided uterus with catgut. Such an operation could be performed either per abdominem or per vaginam. Personally I think the abdominal route is always the best, and especially in dealing with malformations.

Some critics may contend that this variety of malformation so rarely disturbs menstruation or parturition that it is unnecessary to deal with it. I admit that there are many cases where women with uterus bilocularis have had repeated normal parturitions, but if you search carefully the literature you will find a considerable number of cases of abortion, premature labor, placenta previa,

dystocia, post-partum hemorrhage. I consider therefore, that it is always desirable to remove the septum in a uterus bilocularis. Straßmann² gives an interesting account of two cases, in one of which the removal of the septum was attended by most gratifying results.

As regards those extremely rare cases in which one half is the seat of a hematometra, I can conceive of no better procedure than the one I have suggested viz., approaching the septum by a transverse incision just above the isthmus. It would be extremely difficult to excise a hematometra of this variety but fortunately all that is necessary in this complication of uterus bilocularis is to remove the septum. This being removed there can be no further accumulation of blood in the atretic half and pregnancy and parturition should not be unduly disturbed.

I feel confident, then, that this variety of malformation will ultimately be satisfactorily dealt with in some such manner as has been indicated.

Partial septum. (Uterus subseptus.) In cases of this variety where the septum is limited to the fundus, parturition may be disturbed but menstruation and general health are not affected unless there is some other complication. In such cases the child may be born without much difficulty but oblique presentation of the child and retention of placenta are not infrequent. Such complications I have seen upon three or four occasions, and all writers refer to the frequency of these occurrences.

Judging by the recorded cases and those which I have seen, I am not convinced that operative interference is necessary in this variety of malformation. But it would be a very simple matter to remove the septum in the manner already recommended for uterus bilocularis.

A more radical proceeding would be to resect the uterus as Straßmann has recommended.

Where the septum is limited to the lower part of the uterus *subseptus cervicalis* miscarriages seem to be unusually frequent and

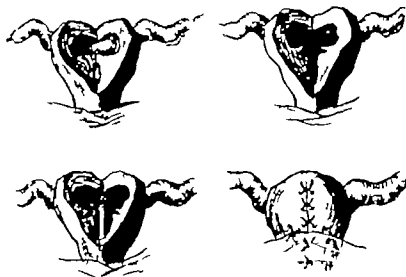


Fig.

dystocia naturally may be extreme. There are a considerable number of cases recorded where the delivery has had to be terminated by version, craniotomy or cesarean section. The diagnosis is not difficult. In the non-gravid by passing a sound through each cervical canal one can tell the extent of the septum. Neither should it be difficult in the parturient, for if the cervical septum is divided and the cervix is dilated one will be able to tell by anesthetizing the patient and passing one's hand into the vagina and the fingers into the uterus whether or not there is any septum in the body. In the pregnant, however it will generally be necessary to wait until labor occurs.

The treatment of the condition is simply to excise the septum. In the non-gravid this might be done from the vagina. The bladder could be pushed off the cervix and the uterus divided as in vaginal cesarean section. The septum could then be readily excised, the uterus plugged with gauze, and the uterine wound sutured.

If the condition has to be dealt with during labor it is unnecessary to divide the cervix for the septum can be divided by scissors under the protection of one or more fingers passed through the dilated cervix.

C WHEN THE TWO MÜLLERIAN DUCTS ARE MORE OR LESS IMPERFECTLY FUSED

Uterus cordiformis—uterus arcuatus This is the simplest variety of this group of malformations. The depression at the fundus varies, and not infrequently there is a septum more or less marked. Where the depression is very slight and the septum well marked, the malformation really assumes the form of the uterus subseptus, while at the other extreme where the depression is deep and the two bodies markedly separated it passes into the uterus bicornis unicolis the next variety to be considered. Now it is important to appreciate this, for the surgical treatment differs, if surgical interference is necessary according as the uterus cordiformis assumes the former or the latter type. This will be best appreciated by considering the surgical treatment which has recently been proposed and carried out by Strassmann.

Strassmann's first contribution to the subject appeared in 1907 and his latest communication, as far as I know appeared last year. The operation recommended by Strassmann consists in suturing the two halves together after cutting a wedge out of the two

halves. It is best understood by the accompanying illustration.

In his last communication Strassmann was able to record two spontaneous births at full time. The result was most satisfactory for the woman prior to the operation had had eight miscarriages. In the paper he mentions cases operated upon by Puppel and Truzzi.

Personally I have seen a considerable number of cases of uterus cordiform and uterus bicorni unicollis, and in looking back on them I believe some might have been satisfactorily dealt with in the manner described by Strassmann. I feel also quite certain of this, however that the more nearly the uterus cordiform approaches the uterus bicorni unicollis the more difficult will re-

much advantage to resect a uterus in such cases?

Personally I do not agree with such critics. If one consults the literature on the subject one finds that abortions, premature births, malpositions of child, post partum hemorrhage, retention of placenta in one horn, and sepsis are by no means infrequent. Having had no experience of the operation I cannot write with any authority but I think that resection might be employed with advantage in carefully chosen cases.

Uterus bicorni unicollis. This is one of the commonest of the marked deformities which we encounter and many cases have



Fig. 1

section be. In the last case of bicorni unicollis operated upon and which I shall describe when considering that variety of malformation it would have been futile to attempt Strassmann operation. But I believe when the uterine bodies are incompletely divided and when there is a wide entrance so to speak into each cornu, an operation such as Strassmann has described might be carried out with great benefit to certain patients.

Further I would say this in regard to Strassmann's operation that I am entirely opposed to the vaginal route. I feel certain it is infinitely safer to deal with these cases through an abdominal incision as Puppel and Truzzi did.

From what I have said it is obvious that resection of the uterus can only be performed in the simpler forms of double uterus so that critics might say. Is it really necessary or of

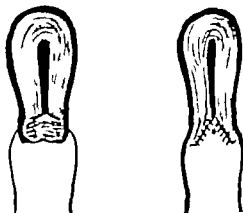


Fig. 2

been recorded, particularly the variety in which one cornu is rudimentary. We are at present considering however the variety in which both horns are symmetrical. I have seen several cases of this variety and have twice opened the abdomen and accurately observed the malformed uterus *in situ*. The first case was not of special interest. It was a case of double salpingo-oophoritis. The tubes and ovaries prevented the ordinary appearance of this condition, so they were removed and the uterus left. The patient made an excellent recovery and was much relieved of her discomforts.

But the second case was of particular interest and was operated upon by me in a private nursing home about eighteen months

ago. The result which followed the hemi hysterectomy I performed has been so successful that I make no apology for describing the case in some detail.

The case is that of a young lady aged twenty who was brought to me by her mother on account of extreme dysmenorrhoea. She was a healthy well developed woman bright and intelligent. Her menstruation was occasionally slightly late but of about the normal character as regards duration and quantity of discharge. Her mother informed me that she had been in the hands of another gynecologist for

number of years and that he had dilated the cervix and removed one ovary which was slightly enlarged. She also told me that at the operation he had discovered a double uterus and that he now proposed that the other ovary should be removed as the dysmenorrhoea was as bad as ever. I informed the patient and her mother that I could offer no

menorrhoea is very frequent with uterus bicornis unicollis. Certainly one should try this course prior to performing hysterectomy when radical treatment is necessary. Oophorectomy of course is a most undesirable proceeding.

The extreme dystocia which may occasionally occur is exemplified in Galabin's case in which cesarean section was necessary because the child developed partly in one half and partly in the other.

Rudimentary horn. The variety of double uterus in which one horn is rudimentary is a condition so well known that it is unnecessary for me to take up time with its consideration. We are all familiar with this condition as-

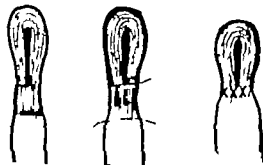


Fig. 4



Fig. 5

opinion until I had examined the patient under an anæsthetic. This I did and found symmetrical uterus bicornis unicollis. I could get the sound not the right half readily but not into the left half. Asked for my opinion as regards treatment I informed them that I, as absolutely opposed to removing the other right ovary. I also informed them that I was inclined to think that the dysmenorrhoea might be relieved by removing one uterine horn for although the pain is not limited to one side I thought in all probability the two horns were contracting irregularly and certainly the canal of the left half was narrower than the right. I proposed, therefore, hemihysterectomy. A few days later I performed that operation and the result has been beyond my expectations so she has now no pain in her menstrual periods, which are absolutely regular and normal. I see no reason why she should not marry and have children. She has a normal-sized uterus unicornis and a healthy right ovary and tube.

I feel certain this procedure is well worth considering in cases of this nature for dys-

menorrhoea is very frequent with uterus bicornis unicollis. Certainly one should try this course prior to performing hysterectomy when radical treatment is necessary. Oophorectomy of course is a most undesirable proceeding. The extreme dystocia which may occasionally occur is exemplified in Galabin's case in which cesarean section was necessary because the child developed partly in one half and partly in the other. *Rudimentary horn.* The variety of double uterus in which one horn is rudimentary is a condition so well known that it is unnecessary for me to take up time with its consideration. We are all familiar with this condition as-

latter cases there may be a considerable difficulty in removing the born. Indeed the difficulty may be so great that the operator is compelled to remove the whole uterus as for example in the case recorded by Wilson.

Uterus didelphys In this variety of malformation the general health, menstruation, and parturition are rarely disturbed if each half is well developed and there is no obstruction of either vaginal canal. Such cases therefore rarely call for surgical interference. I have seen in connection with my private and hospital practice several cases of this nature. In the two cases in non-pregnant women the condition was discovered at the time of examination and the discomforts complained of could in no wise be attributed to the malformation. In the four cases seen in parturient women the vaginal septum had twice to be divided. A summary of these cases will be found in *Operative Midwifery*.

Such complications as a backward displacement or haematometra of one uterine half, atresia of one cervix, fibromyoma, and even carcinoma of one or both halves have been recorded and may arise as complication and disturb the general health, menstruation and parturition, but they are of extreme rarity. It stands to reason therefore that surgical interference is seldom necessary and that the most suitable procedure for cases in which one uterine half causes trouble is hysterectomy of the faulty half. The healthy half should assuredly be left unless it is affected by malignant disease or a large fibromyoma.

I feel certain that every one will agree with me that to attempt to form a single uterus out of two halves of a uterus didelphys would be the height of surgical folly. I cannot conceive that such an operation will ever be lauded.

Uterus pseudodidelphys A great number of cases termed uterus didelphys are really examples of pseudodidelphys. The distinction is of importance anatomically but clinically the two conditions are the same. The treatment of the two conditions is similar and so I may pass on to the next group of deformities.

D WHEN THE DEFORMITY AFFECTS THE VAGINA MORE ESPECIALLY

In many of the varieties of malformations of uterus which we have been considering, the vagina is also deformed. Thus in atresia of the cervix there is frequently a complete atresia of vagina, while in the septate and double uterus the vagina is often divided by a more or less complete septum. As regards the vaginal septum little need be said; the septum is easily dealt with and can be removed without difficulty with scissors, as I have had to do on two occasions where the septum formed an obstruction to the passage of the child. There are many cases on record where a similar proceeding was necessary.

In those cases where there is an atresia of one half and haematometra or hematocolpos, the treatment will depend on the extent of the atresia. If there is a simple membrane or diaphragm in one canal division of it is all that is necessary, but if the atresia is extensive removal of the corresponding uterine half will generally give the best result. The problem therefore resolves itself into the treatment of atresia of the vagina.

The surgical problem of pronounced atresia of the vagina has long interested operators, for the great difficulty has always been to secure a canal which would not contract and return to the condition it was in prior to operation.

Now I think we are all agreed that the older attempt to secure a permanently patent vagina by dissection from below have generally proved unsatisfactory. The earliest operative proceeding was the attempt to establish a vagina by simple dissection. In many cases the bladder and rectum were separated and a tubular passage formed but almost invariably the canal contracted in spite of every attempt to maintain its patency by dilators.

And once upon this simple procedure was the attempt to maintain a patent canal by grafting upon the cellular tissue portions of skin and mucous membrane from the neighborhood of the vulva. Quite a number of cases of success from these methods are recorded especially in cases where the atresia was confined to the lower third of the vagina.

and the mucous membrane of labia were employed. Other devices of employing folds of peritoneum and Thiersch grafts were less successful, while hetero-grafting of skin or mucous membrane from man and the lower animals were of experimental interest, but were never extensively employed and were almost without exception unsatisfactory.

A great advance in recent years was initiated by Pfannenstiel who pointed out the importance of opening the abdomen and determining exactly the condition of uterus and tubes before proceeding to the construction of the vagina. In the first operation Pfannenstiel brought down the cervix to a low vaginal rudiment of about 1½ cm in



Fig 6

depth. The canal remained patent and the women menstruated regularly.

I am not concerned here with these simple cases of atresia in which a thin membrane obstructs the canal. I propose to consider only those in which the obstructing tissue is of considerable thickness.

In dealing with such cases the operator should first open the abdomen and determine the condition of uterus and adnexa, and confirm his diagnosis of the site and extent of the vaginal atresia. Having done thus the procedure to be followed will depend on the situation and extent of the obstruction.

Supposing the atresia to be in the lower part with absolutely no trace of a vaginal orifice the operator having emptied the hematometra or hematocolpos should separate off the bladder as far as possible from the

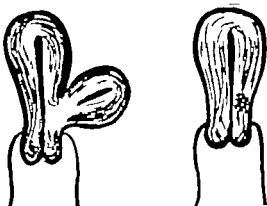


Fig 7

abdomen and loosen the attachments of uterus and upper two-thirds of vagina rudiment. In doing this he may have to divide the uterine arteries. He should then dissect up from below and grasp the blind end of the vagina which is pushed down from above by his assistant. The vaginal sac should then be incised and stitched to the skin margin. This somewhat simplified procedure was the method employed by Pfannenstiel in a case operated upon by him in 1900 and described by Cohn.

If the atresia is situated in the middle third and there exists a lower and upper vaginal rudiment, an end-to-end anastomosis of the vagina should be attempted by means of com

Zentralbl. f. Gynäk. 1901. 906

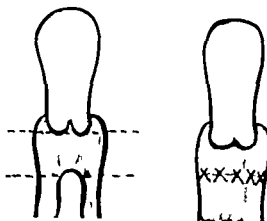


Fig 8

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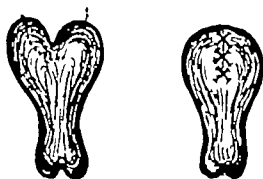


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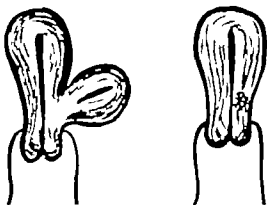


Fig. 7

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Illustrated by Gynak. 1900. 1900.

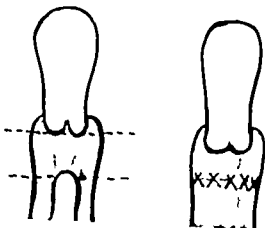


Fig. 8

bled abdominal and perineal manipulations. Should that fail, the lower rudiment must be sacrificed and the upper brought down to the skin. At first only a very shallow vagina will result but it will deepen as the uterus is drawn upwards as Pfannenstiel has shown. In cases where the atresia is situated in the upper part of the vagina and there is a fairly good lower rudiment an attempt should be made to unite the cervix to the vaginal rudiment in the manner already referred to in connection with complete atresia of the cervix. Unfortunately however in case of this nature the cervix is often atretic and it is quite impossible to join uterus and vaginal rudiment, as was well illustrated in Cohn's case already referred to.

In cases of complete atresia with functioning uterus little can be done of a plastic nature. An extremely interesting case of this nature was one recently described by Fordyce, who ultimately found it necessary to perform hysterectomy. Had Fordyce been able to establish a communication from below it might have been possible for him to pull down the uterus and stitch it to the skin. An important point in connection with this case was the fact that Fordyce found it difficult to perform hysterectomy until he had emptied the distended uterus. I believe this is a matter of the very greatest importance in these cases if one is going to attempt any plastic operation. I should very much like to encounter a similar case. I feel certain that it is quite possible after constructing a vagina by Baldwin's or Saenger's method to open the abdomen again some weeks later and establish a permanent communication between uterus and artificial vagina.

This would be preferable to establishing the continuity of the new uterovaginal canal at one and the same time.

This naturally brings me to the consideration of the most recent gynecological procedure constructing a vagina from a portion of isolated bowel.

The justification for doing this major operation, for it must be considered a major operation is a matter of opinion especially in those cases where there is a rudimentary non-functioning uterus when, in other

words the artificial vagina is constructed solely for the purpose of intercourse. The morality of the question I am not going to discuss. I am simply going to put on record a case in which I performed Baldwin's operation and in which I considered I was justified in so doing. I may say I performed the operation in the University Gynecological Department of the Royal Infirmary before the Visiting Gynecological Society when they visited Glasgow in November of last year.

The woman was thirty years of age and married. She was physically well developed & all appearance. She was of normal height, well nourished, had well developed mammae and vulva. There was, however, only the shallowest dipple marking the vaginal entrance. I detected by a recto-abdominal examination made under anaesthesia that there are two movable bodies (ovaries) placed close up against the pelvic brim. I could find no trace of uterus. She had no discomforts in the way of menstrual menses, abdominal pain or headache. Indeed, she enjoyed perfect health. She informed me, however, that her husband threatened divorce. I explained to her the operation which I ultimately performed, and he decided to have it done. The operation was performed as follows. I opened the abdomen and isolated the most dependent loop of ileum. It was situated about a foot from the ileocecal valve. Having done this and closed up the ends of the isolated loop I established lateral anastomosis between the ileum and caecum. I now turned my attention to the perineum and dissected up between bladder and rectum. This was matter of considerable difficulty as there seemed to be a gluggy little loose cellular tissue between these two viscera. Ultimately I established an opening into the peritoneum and pulled down the loop of isolated bowel. I tried to bring one end down but found that impossible although I now believe with proper support of the mesentery it might not be so very difficult. I had, therefore, to bring down the loops doubled up. I then stitched it to the margin of the perineal wound. Two or three days later I opened into the lumen of the bowel.

The patient made an excellent recovery and some months after the vagina was of good depth and admitted one finger. I have not seen her for three months. She did not complain of any mucous discharge.

The operation performed was first demonstrated by Baldwin in 1904.

Phillips of Sheffield and Victor Bonney of London have performed the operation, while on the Continent and in America quite a number have been done.

Those interested in the matter will find

the subject very fully gone into by Marshall¹ Quénou and Schwartz² and Kroemer³

The other method of Sneguireff and Schu bert of making use of a portion of pelvic colon I have no experience of but it is also referred to in some detail in the papers mentioned.

¹ T. Edinburgh Obst. Soc. xxv. 224

² J. Obst. & Gynaec. Brit. Emp. April, 91

³ Rev. de Chir. Franç., 1913

Preski, English & Gals. Gyna. Hæst. 2. 92

You naturally ask what is my attitude towards these operations. At present it is as follows

1 The operations are justifiable with a functionating uterus for the only alternative is hysterectomy

2 They are not justifiable in an unmarried woman with a non functionating uterus.

3 They are sometimes justifiable in a married woman with a non functionating uterus

DEPARTMENT OF TECHNIQUE

A METHOD OF EXPOSING THE PELVIC PORTION OF THE URETER

B. JOHN M. BIRNIE, M.D. SPRINGFIELD, MASSACHUSETTS

THE method of exposing the pelvic portion of the ureter which is herein described may not be new, but up to the time that I conceived the idea I had never seen or heard of it, nor could I find any description of the method, which is as follows:

With the patient in the Trendelenburg position a median incision is made beginning close to the pubic bone and extending upward exposing the space of Retzius in the usual manner. No muscle fibers are cut but the recti are retracted to either side. The point where the parietal peritoneum is reflected onto the bladder is noted and care taken not to open the peritoneal cavity.

Starting at the bladder the peritoneum is wiped away toward the median line separating it from the bladder and pelvic wall, thus exposing the ureter. With retraction one gets a complete exposure of the ureter and any necessary procedures may be carried out under the guidance of the eye. Drainage if necessary may be instituted through the original incision or through a separate stab wound.

Since first employing this operation several months ago I have not had a chance to try it again but, at my suggestion, three of my colleagues at the Springfield Hospital have employed it with complete satisfaction.

TECHNIQUE EMPLOYED IN EXCISION OF A CARCINOMATOUS URETHRA

B. SIGMAR STARK, M.D. CHICAGO

Professor of Clinical Gynecology, Medical Department, University of Chicago; Gynecologist, Cook's General Hospital, Gynecologist, Jewish Hospital

ON December 3d I operated upon a woman fifty years of age in my service at the Cook's General Hospital.

The clinical history of the case was as follows: For period of about one year she had been experiencing increasing difficulty with pain on urinating. At no time was there either purulent or bloody discharge from the urethra. About six weeks previous to the operation she noticed lump in the anterior vaginal wall corresponding to the site of the urethra which rapidly grew in size and was associated with great difficulty in voiding urine.

On examination diffuse infiltration, involving the whole urethral canal about $\frac{1}{2}$ cm. in width and extending up to the pubic arch, was encountered. Milking of the urethra was not followed by discharge from the meatus. A small probe was passed with great difficulty into the bladder. The foruncular glands of both sides are only moderately enlarged. A diagnosis of perineurial carcinoma was made which was confirmed by Dr. Paul Woolley, pathologist to the Cook's General Hospital, who pronounced the same to be an epithelioma, by examination of section removed under cocaine.

The surgical technique employed was as follows: A

curved incision about 4 cm. in length was made directly under the arch of the pubes and continued in depth through the triangular ligament until the retroperitoneal space was reached. From this longitudinal incision through the vaginal wall was then made on either side of the indicated area in posterior direction all beyond the location of the involved tissues. The two vaginal flaps are then deflected by dissection laterally toward the Kocher's hand. Curved hemostats are then placed from above downward on the tissues before they were cut through first on one side and then on the other close to the lateral wall of the pelvis, as far backward as seemed necessary. The object of this was to anticipate hemorrhage from the branches of the internal pelvic vessels coursing through the triangular ligament. This precautionary measure turned out very satisfactorily as the bleeding was almost nil. After liberation of the tumor mass, it was incised along its whole anterior surface into the urethral canal and bladder. This procedure facilitated the final removal of the remainder of the tumor through healthy tissue under ocular supervision, which disclosed the fact that the part of the bladder wall immediately surrounding the internal urethral orifice had been excised. After ligation of the vessels included in the curved hemostats by transfixion,

the bladder orifice was sutured to the vaginal wall in such manner as to leave an opening only large enough to admit the introduction of No. 1 soft rubber catheter. Anterior to the endovaginal opening the vaginal flaps were brought together in the median line by chromic acid catgut suture, leaving space under the pubic arch for drainage of the rather large retroperitoneal cavity. A soft rubber catheter was fixed in the bladder by suture to the vagina for continuous drainage. The inguinal glands of both sides were likewise excised.

After three days the catheter was removed and to my surprise the patient had fairly good control of her urine which was continuous until she got up on the ninth day.

Since then the condition is this—she can hold her urine while in bed and has fair control when up, that is, there is no continuous incontinence, but when the desire to pass urine comes on she must void it once.

I have been prompted to report this case because of the difficulty I experienced, in looking up the literature of the subject, in finding any detailed description of the surgical manner of dealing with this condition. The technique practiced was evolved by myself and is seemingly correct in principle.

A SIMPLE HEAT METHOD OF STERILIZING AND STORING CATGUT

AFTER TEN YEARS USE OF IT

B. WILLARD BARTLETT, A. M., M. D., SAN LOUIS.

AFTER years of experimentation with absorbable materials, the author began, early in 1904, to employ regularly the method of preparing catgut which was embodied in a preliminary report published in the *Interstate Medical Journal* (March 1905). The Mayo Clinic was the first of the many large institutions to adopt and use it as a routine procedure. During the nine years which have just passed, gut prepared in this way has been used at Rochester with satisfaction in more than sixty-three thousand operations. This is perhaps the most eloquent testimonial that could be accorded the practical worth of a hospital method and makes it unnecessary to detail the many and crucial bacteriologic checks which have been employed.

The real object of this writing is not only to set forth the small refinements which have crept into the method during the ten years of its employment by me, but at the same time to render impossible in other hands the occasional errors in technique which have resulted from lack of detail in my early published directions. Frequent requests for information make my duty in this direction obvious.

The process is to be divided into these definite steps: *drying, sterilizing, and storage*.

1. The ordinary commercial ten foot catgut strand is divided into four equal lengths, each of which is made into a coil about the diameter of a ball or quarter. By twisting the last free end three or four times around the components of this little coil the latter is enabled to maintain its shape. These coils are then strung like beads upon a thread so that any desired number can

be conveniently handled by simply grasping the thread.

2. The string of catgut coils is dried in a bacteriologist's dry sterilizer for four successive hours at a temperature of 80 degrees, 90 degrees, 100 degrees, and 110 degrees centigrade. Let thin gauze be interposed between catgut and metal. This should not be attempted on a damp day or in a room which steam enters.

3. The catgut is immediately placed in liquid alcohol (petrolatum liquidum) where it is allowed to remain until perfectly clear in the sense that the term is used in the preparation of histological specimens. This is usually accomplished in a few hours, though it has been my custom to allow the gut to remain in the oil over night. Thin paper must line the receptacle so that the catgut may not touch its walls.

4. The vessel containing the oil is placed upon a pan of sand and the temperature raised by a gas-flame during one hour to 160 degrees centigrade which temperature is maintained for a second hour.

5. By seizing the thread with a sterile forceps the gut is lifted out of the oil, an excess of which is allowed to drip off the thread is cut and the coils dropped into a solution of iodine crystals in Columbian spirits (deodorized methyl alcohol) the proportion of iodine varying according to the diameter of the catgut. For No. 00 it should be 1 to 700 for No. 0, 1 to 600 for No. 1 to 500 for No. 2 1 to 400 for No. 3 1 to 300 for No. 4 1 to 200 the iodine being taken by weight and the alcohol by volume. The material becomes

ready for use in a few hours, and should remain in the solution indefinitely without deterioration. A few coils may be removed at any time with no risk of contaminating those left behind.

Although I should be far from adopting a surgical procedure simply because it is economical it will strike anyone that the chemicals here used are very cheap. Furthermore the liquid alcoholene can be used repeatedly in spite of its color growing darker with reheating.

It seems to me important that the gut should be thoroughly cleared before the oil is heated in order that we may thus be certain that the temperature at the center of the strand becomes as high as that of the oil surrounding it.

It may be noted that I do not remove the oil from the gut before placing it in the storing solution. This is avoided purposely since catgut which is perfectly free from oil is so very sensitive to the action of water that it readily untwists and becomes tangled after it has been used in a wound but a few moments. This storing fluid simply takes off enough oil from the exterior of the strand so that it is not too slippery for use and the alcoholene being a bland, non-irritating substance can safely be introduced into the tissues.

The iodine rapidly permeates the strand, which will be found stained brown after a few hours, assuring the surgeon that he is introducing an antiseptic as well as a thoroughly sterile suture material and one which is readily seen in the field of operation.

As far as the tensile strength the elasticity and the pliability of this finished product are concerned, I may state that these leave nothing to be desired.

I have made a large number of breaking tests, and have found no other heat method to produce a stronger strand.

Catgut treated in this way lasts in the tissues somewhat longer than the same size strand of plain gut treated by most of the other methods in vogue at the present time.

I have found that the material so treated deteriorates not at all with age, neither as far as strength nor sterility is concerned.

The physical qualities of the finished strand will astonish the surgeon who uses it for the first time. I am very certain that a blind man used to handling catgut prepared by other methods would not recognize this product as catgut at all if it were placed in his sensitive hands.

A NEW OPERATIVE PROCEDURE FOR THE TREATMENT OF SUPPURATIVE SALPINGITIS IN YOUNG WOMEN

B. W. BLAIR BELL, D. S. M. D. LIVERPOOL, ENGLAND

FOR the treatment of bilateral pyosalpinges in young women one of the following operative procedures is usually adopted: Bilateral salpingectomy by ligature.

2. Bilateral salpingectomy with excision of the terine ends of the tubes.

3. Bilateral salpingectomy by one of the above methods, with unilateral or bilateral oophorectomy.

4. Bilateral salpingectomy by one of the above methods, and hysterectomy (subtotal or total) with or without unilateral or bilateral oophorectomy.

I have myself always held the opinion, which is based on experimental and clinical observation, that complete bilateral oophorectomy in young women is an unscientific and unjustifiable

procedure in the absence of malignant disease, of bilateral innocent tumors, or of bilateral ovarian abscesses.

It is, however, impossible here to enter into a discussion of this subject. It is one about which diametrically opposed views are held. The reasons for my own are set out in the communications referred to.^{1,2} Let me state, therefore, at the commencement that the justification for and desirability of the procedure I have devised, and shall describe presently, depend to a large extent on the belief that the internal secretions of the gonads and the existence of the menstrual function are of considerable benefit, both physical and psychical, to the young adult female.

That is the first important point, and it is a physiological one.

Next, with regard to the pathological aspect of the procedure, it is well known that with ascending tubal infections the fundus of the

¹ Bell, W. Blair. "The genital functions of the ductless glands." *Ann. & Gyn. Soc. London*, May 1911, vol. 3, no. 1, p. 100.
² Bell, W. Blair. "The relation of the internal secretions to the female characteristics and functions in health and disease." *Proc. Roy. Soc. Med.*, 1911.

uterus, as well as the cervix in gonorrheal conditions, is involved (Fig. 1). As a clinical result of infection of the body of the uterus we frequently see very severe menorrhagia and sometimes leucorrhea persist after bilateral salpingectomy. Consequently it is advisable to adopt some procedure which will take into account the infection of the body of the uterus. Hence the pathological indications are no less important than the physiological.

My method of procedure meets both the physiological and pathological requirements described above.

It aims at removing diseased structures as widely as possible while one ovary, or a portion of it, is preserved, together with sufficient endometrium to ensure the subsequent occurrence of regular menstruation.

In other words, both tubes, one ovary, and a wedge-shaped portion of the fundus uteri are removed.

The following are the steps of the operation:

1. The abdomen is opened in the usual way by a median subumbilical incision.

2. All superficial adhesions of omentum or bowel are put upon the stretch ligated when necessary and cut through.

3. The intestines are then carefully packed off with the thin rubber pack which I have used for some years. Gauze can subsequently be introduced against the rubber pack if necessary.

4. The tubes and uterus are next completely freed, and pus in the pelvis is carefully mopped up as it is seen.

5. The patient is now lowered into the Trendelenburg position.

6. The uterus is raised by means of a volsellum attached to the fundus, and the operator proceeds to remove the tubes, fundus uteri and one ovary in the following manner: (The steps are described for the operator who stands, as the writer does, on the left side of the patient placed in the Trendelenburg position.)

- (a) The free edge of the mesosalpinx on the right side is seized with a pair of long compression forceps. The edge of the mesosalpinx is divided between the attachment of the forceps and the tube, which is held with another pair of compression forceps, and the mesosalpinx is cut through up to the uterine attachment of the tube. One or two bleeding vessels require to be caught in compression forceps and ligated. Likewise the free edge of the mesosalpinx is tied and the forceps are removed.

- (b) The ovary and tube on the left side are next freed in a similar manner except for the



Fig. 1. Infection of the fundus uteri. From case of suppurative salpingitis.

Not the round-cell invasion of the musculature, proceeding from small thin cased canal on the left of the section seen.

modifications needed by the removal of the ovary. The infundibulopelvic ligament is caught in two pairs of compression forceps and divided between them. The broad ligament just below the junction of the mesosalpinx and meso-ovarium is now cut through with scissors up to the uterus, and the bleeding vessels are caught as they are divided. If the curve of the junction of meso-ovarium and mesosalpinx be followed the section of the broad ligament will end just below the insertion of the tube and the attachment of the ovarian ligament. The severed vessels are tied.

- (c) A superficial incision is made from about half an inch below the insertion of the right tube across the front of the fundus of the uterus through the round ligaments, which are caught in compression forceps and tied, to a similar point on the opposite side. Another incision is then made between the same two points across the fundus posteriorly. The portion of fundus uteri thus marked out is removed by deepening the incisions downwards and inwards so that a wedge-shaped excision of the fundus is carried out (Fig. 2). The ascending uterine arteries on each side will be cut through in the final separation of the portion excised. They should be caught as they are cut, and ligated after the fundus has been removed.

- (d) The large deep wedge-shaped wound in

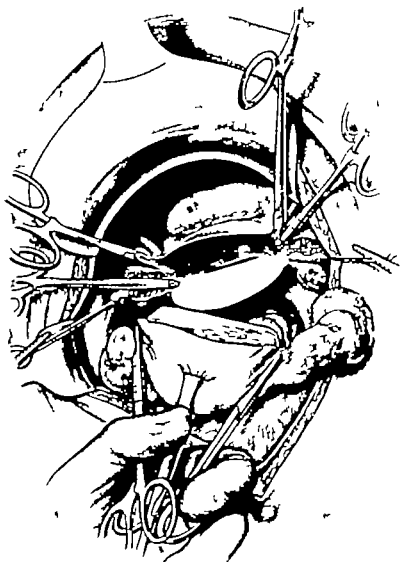


Fig. Illustration of operation. The operation at this stage when the diseased parts have just been completely excised and are ready for removal. They are left in situ to show the relation of the parts removed to the remaining structures. (From Baughard' System of Operative Surgery.)

the uterus is partially closed by the insertion of four deeply placed mattress sutures which pass through both flaps.

(c) The edges of the right mesosalpinx are sewn together with a running suture, and all ligated points are covered with peritoneum. The running suture is continued over the summit of

the stump of the uterus, in order to coapt its peritoneal surfaces of the flaps. The suture is then carried on to close the two peritoneal surfaces of the divided broad ligament on the left side. Care is taken to bury the ligated stump of the infundibulopelvic ligament between the two layers of peritoneum.

(f) The cut ends of the round ligaments are now sewn to the uterine stump on each side.

(g) The right ovarian ligament is also sewn to the right side of the uterine stump, and if necessary the free edge of the meso-ovarium is attached to the round ligament of the same side to prevent prolapse of the ovary.

7 Finally the abdominal incision is closed in the manner adopted by the individual operator.

In my hands the operation has proved most satisfactory. All symptoms have been removed and the patients have in all cases—except the last one operated upon quite recently—menstruated regularly and painlessly and to a moderate extent.

Since I devised this operation some eighteen months ago I have not had a sufficient number of cases nor are the after histories long enough to

report on at present, but this essential information will be given in due course.

Before closing this paper it is necessary that I should call attention to a brief statement in the *Lancet*, which reported the International Congress last August, to the effect that Professor Beutner of Geneva had made a communication concerning an operation which, so far as I can gather from the brief statement made, corresponds with mine. I was not in London when the communication was made nor have I yet had an opportunity of reading an account of Professor Beutner's technique. Before any mention of his procedure had been made I had contributed an account of my operation to the forthcoming edition of Burghard's *Operative Surgery*. Naturally too I had been performing the operation long before I wrote any account of it.

Lancet, Lond. 1903, August 14, p. 412, and August 22, p. 397.

A PRELIMINARY REPORT ON THE TREATMENT OF FRACTURES BY FIXATION WITH ANIMAL BONE PLATES AND BONE SCREWS¹

B. E. J. BROUGHAM, M.D.

A. C. ECKE, M.D. *Chicago*

FIXATION devices consisting of bone human or animal and ivory are not new; their technique simply varies. All the methods have their origin in the effort to procure the use of probable absorbable material and so dispense with the metallic fixation material, which frequently causes good deal of trouble.

The ideal fixation for fractures is undoubtedly the intramedullary autograft, but the technique is not so simple and the procedure requires really two operations.

Magnusson's ivory plates countersunk into the fractured bones and transfixed with ivory screws is an admirable attempt to use absorbable material, but again, his technique is not simple.

Our procedure gives efficient fixation and the technique is as mechanically simple as that of the Lane plate, and requires no complicated tools. The material is bone from government inspected cattle. The bone comes to the market bleached, deprived of its animal matter and in dry form.

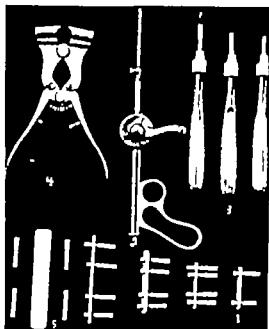
The working set of bone plates (Fig. 1) is five in number. Plate No. 1 being the smallest and Plate No. 5 being the largest. They are all of equal thickness, about one-eighth of an inch, and according to standard gauge No. 9. The plates

differ in their length and width, and the number of threaded holes in each plate. They are concave on the under surface. The tops are plain with slightly rounded ends and edges.

The complete set is received by the surgeon already drilled and threaded. They are thoroughly scrubbed with hot water, soap and brush, rinsed and sterilized by boiling for two hours and placed in formalized alcohol shortly before using; they are put in normal salt solution. Neither the boiling nor the antiseptics injure the plate or the trueeness of the threads.

The size of the threads are twenty to the inch, and are fashioned with a 2720 standard steel tap which signifies twelve gauge drill with which the holes are drilled, and corresponding to the thread turned upon the bone screws. The purpose of the greater number of holes in the larger plates is to accommodate if occasion requires. Plates may be sawed off and made shorter. The remaining holes need not serve as drainage. The entire set of five plates with screws are sterilized and made ready for the operation. The surgeon selects from the lot the plate best suited to the fracture he desires to fix.

After bringing the ends in apposition and holding the same firmly in place with a pair of forceps he places the plate in the wound over the fracture,



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The plate is held from slipping by an assistant with long tissue forceps, pressing up on it. Next a Richter brace (2) previously mounted with the two gauge spiral drill is used to drill the fractured bone at each end, care being taken not to go deeper than is needed—just through the cortex and not the medulla. Next the steel tap previously mounted in long handled chuck (3) is carefully turned through the already made thread in the plate and on into the bone turning it backward to ease it and prevent bleeding, and turning it ahead to fashion the thread in the underlying fractured bone. Next the long handled holding chuck (1) with the bone screw previously mounted, is taken up and the screw is turned carefully and securely through the plate and through the cortex of the underlying fractured bone. After testing its firmness by gentle upward traction on the chuck, the screw is in place with a pair of forceps, loosen the grip of the chuck on the bone screw and remove the holding chuck, leaving the bone screw with the part held by the chuck projecting upwards.

The empty holding chuck is then refitted by assistant. We have two holding chucks to facilitate the placing of screws. Next, the bone is again drilled through the hole in the other extremity of the plate, the tap introduced, the bone screw placed in the same manner and the plate

thus secured. Next, the intermediate holes are drilled and the bone screws placed. Usually four are put in. The projecting bone screw above the bone plate may be clipped off after each bone screw is placed and before proceeding with another; or they may all be placed, and then sawed off with a small metacarpal saw. I use our special bone clipper (4) for clipping off the projecting bone screws; each screw must be clipped off when it is placed to make room to lift the clipper accurately to the screw to be clipped off. This instrument is a compound lever clipper and very powerful, and if not held free and in accurate position may damage the bone screw.

The entire operation is conducted according to the technique of Lane of London. Towels are clamped to the edges of the wound. All the suture material, needles, gauze sponges, plates, screws, drills, and everything used to carry on the operation must be handled with steel instruments.

After wound is sutured dressing and cast are applied. When one or more plates have been used from the set they may be ordered singly and the working set thereby kept complete. The stock material from which the bone plates are made are of sufficient bulk to permit much heavier and much larger plates and screws if it were desired, but keeping in mind the absorption of the plates we made these as light as consistent with strength.

The other instrument used are the usual bone plating instrument familiar to surgeons. We recommend and have used satisfactorily Lane forceps, Lane elevator, and Richter brace. The bone plates have been used in the following three cases.

CASE 1. W. P. R., male, aged 4 years, working in meat market, August 9. While attempting to lift and run around a pig tier of beef came slipped from his grip and slid on to his left thigh. With renewed effort and exertion of muscles and thigh he succeeded in placing back upon his back. Patient began to walk, pain in the upper thigh but he put on work and bled about with and without care for period of 4 days, when his left side suddenly collapsed and let him down on the ground. He was unable to walk and was conveyed to his home. Three days later he admitted to the Park and Hospital Examination showed marked swelling of the left upper thigh anteriorly and laterally. X-ray showed an oblique subtrochanteric fracture. The fracture was treated for eight weeks by extension, counterextension and long side support. At the end of this time there seemed to be no callus, high angling, and shortening of an inch and half. He relieved of external orthosis. We decided to plate the femur. At operation no callus was found. The ends of the fractured bones are bruised and thoroughly callus of the fracture reduced and bone plate three inches long with four screw holes applied. There was



Case 1. Male, age 3 showing bone plate and fracture right tibia after plating. Patient stood in ten weeks.



Case 2. Male, age 8 years. Bone plate in position day after operation.

good deal of difficulty to get room for upper end of plate because of trochanter and only one screw could be placed here. The bone was very soft. Wound closed with silk worm sutures, dressing and plaster cast applied. Patient returned to bed. No extension. Cast remained for four and half weeks, being noted and refixed as removed. Dressing showed moderate amount of oozing, sutures taken out, dressing applied. Examination showed no angling or shortening. Another cast was put on and left four weeks. At its removal the limb X-rayed showing plate in good position. Palpation showed large amount of callus. Patient unable to elevate thigh, abduct and adduct same. Callus was not sufficient to stand at the time and the patient attempted bear his weight on the limb causing callus to yield. X-ray showed lower end of plate slightly lifted, allowing slight angling. Thereupon cast resupplied and remained six weeks. Thereafter cast removal, patient allowed to be about with aid of crutch bar.

We are satisfied the plate held and served its purpose sufficiently long for a normal fracture to unite and it even stimulated callus formation in our opinion.

Case 3. Y. M., male aged 3 years laborer for construction company. He was injured by roof collapsing and falling upon him while working building

standing on an elevation about five feet from the ground. He was thrown and pinned under fallen roof. He was admitted to Passaic Hospital the day of his accident, December 3, 1914.

Examination showed five fractures of the left leg, two of the femur, one of the tibia, and two of the fibula. The fracture of tibia compound, of oblique type, upper fragment projecting through wound and foot dangling. This fracture was plated immediately with the bone plate and four screws. The plate contained six holes, the two unused holes serving for drainage. The wound was closed with small strip of gauze for drainage. Dressing of cast applied up to knee, and leg put on double incline plane for the femur fractures.

Cast was fenestrated ten days later drain and stitches removed, and wound comparatively dry. Cast was removed after three weeks. Second cast applied and left for five weeks after its removal patient remained on incline plane for week longer. He was then allowed to be up and about with crutches. A week later was walking with aid of cane. X-ray (Fig. 1) showed plate in position and tibia in good line also loose piece of fibula well anastomosed.

Case 4. Wm. B. male aged 8 years, admitted to Passaic Hospital January 30, 1914, to the service of Dr. M. L. Harris. He had been injured by being knocked down by passing automobile. Examination showed fracture about middle of left femur. Repeated attempts at closed reduction not being satisfactory February 3th

two week after his admission, case as plated by Dr Harris with the bone plate and four bone screws. Operation disclosed separation of fractured end with muscle tissue interposed. Fracture was of the transverse type with V-shaped portion of lower fragment about three-eighths of an inch in widest measurement wanting. Harris wire suture used for closing wound, and cast applied. Patient put to bed, no extension. X-ray following day showed plate in position and perfect apposition of fractured

ends. Cast fenestrated February 24th, wound dry, wire suture removed, reinforced cast without removal. X-ray 13th March twelve days after plating, perfect apposition of fracture and bone plate in position.

The cast was removed five and a half weeks from date of operation. Patient returned to bed, no cast applied. Examination shows solid union, large callus, no shortening; perfect results. Final X-ray (Fig. 2) showed bone plate in position, perfect alignment of fracture.

THE TREATMENT OF A CASE OF BIRTH FRACTURE OF THE SHAFT OF THE FEMUR

B. VILLYA P. BLAIR, A. M., M. D. F. A. C. S., SAINT LOUIS, MISSOURI

IN the case of a large infant in a breech presentation the shaft of the left femur had suffered a transverse fracture considerable angling resulting. This was to me a new condition and its treatment presented several special problems.

First, the very meager circulation of the lower limb must not be impeded by tight bandages, nor do I believe the skin would tolerate adhesive plaster. Second, the ordinary care of a newborn infant, bathing, nuzzling, etc. must not be

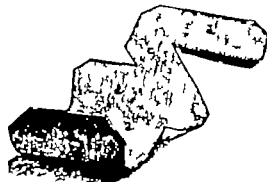
fairly closely. The small buttocks (b) maintained the stability of the body portion by resting squarely on the bed or table. The thigh portion (c) corresponded with the normal position of baby's thigh when it is crying and thereby trailing. The leg part of the splint (d) as longer than the infant's leg and its lower border was bent medially to form small shelf.

This splint was heavily padded. The baby was laid in the body position resting there simply by its weight while the thigh and leg, after being covered with cotton, were bandaged to the splint. The napkin was not placed on the child in the ordinary manner but was folded in several thicknesses, and simply laid under the buttocks, the upper border of this pad extending up between the splint and the nates.

This splint was entirely removed and reapplied every day at the time the child was bathed and powdered, the injured limb being held in the proper position by the aid of a second person. After the first few days the application of the splint was done entirely by the nurse. The baby nursed and apparently suffered no discomfort from the splint.

In the first attempt at making the splint, the part for the lower limb was made vertical and the leg and thigh bandaged loosely to it. This proved ineffective and also the very loose bandaging over cotton seriously impeded the circulation. The splint was then bent to a right angle to the knee. This was an improvement but there was forward angling of the shaft when the child cried, so a new splint cut on the lines shown seemed to overcome these difficulties.

There was firm union in excellent position in four weeks.



interfered with. Last the injured bone should be maintained in its proper outline while healing occurs. These indications were met by the splint shown in the illustration.

A pasteboard pattern was first made and from it a splint of galvanized steel was cut. The steel was of the weight used for house gutters and down spouts. The body portion (b) reached from the greater trochanter of the femur to the villa and encompassed the back and both sides

PERSONAL EXPERIENCES WITH COAGULÈNE-KOCHER FONIO

A CRITIQUE OF TWENTY CASES IN WHICH THE PREPARATION WAS USED

BY GEORGE DE TARNOWSKY M. D. CHICAGO

Attending Surgeon, Cook County and Ravenswood Hospitals

WHILE on a recent visit to Kocher's clinic in Berne, my attention was called to a new method of checking hemorrhage in the course of surgical operations. Doctor Anton Fonio, first assistant to Professor Kocher who elaborated the preparation, published his first report of seventy five cases (December 1912 to March, 1913) in the *Correspondenz Blatt für Schweizer Ärzte* (1) and I have made free use of his article in the preparation of this report. Dr Fonio began his study of the subject in 1909 (2) Professor Kocher having requested him to evolve a practical thrombin for clinical purposes. Kocher himself had for several years successfully made use of pieces of fresh muscle-tissue applied to oozing surfaces in brain operations. The monographs of Bordet (3) Noll (4) Sahli (5) Lilliefeld (6), Fuld (7) Zak (8) and of Bordet and Delange (9 and 10) should be freely consulted in order to obtain a detailed account of the various theories of blood coagulation.

In view of the many conflicting opinions expressed, it seems probable that in the process of blood-coagulation two or three mother substances contribute, either equally or in a varying degree, to the reaction, thus allowing the active coagulation agent to develop. The presence of calcium salts is necessary for the complete reaction. The following tabulated grouping of the newest theories of coagulation is taken from Fonio's original article

- A. Schmidt: Prothrombin + synaptase = thrombin (fibro-ferment)
 Lilliefeld: Leucocyclin + fibrinogen = thrombin + calcium = fibrin + fibrin-ferment (soluble globulin)
 Arlhes and Paget: Fibrin-ferment + calcium + fibrinogen = fibrin + globulin (soluble)
 Morawitz: Thrombolinase + thrombogen = prothrombin + (b. prothrombin) + calcium = thrombin (fibro-ferment)
 Fuld: Cytosym + plasmozym + calcium = holozym (active ferment)
 Noll: Thrombocytin + thrombogen + fibrinogen + calcium = fibrin + thrombin (soluble)
 Bordet and Delange: Cytosym + serosym + calcium = thrombin (active agent) = fibrin

With these several theories as a working basis, Fonio sought to isolate one of the active coagulating elements of the blood in such a manner and quantity as to make its everyday usage practicable. It had been known for some time that

Bizzozzeri's blood-platelets were of a lighter specific gravity than either the erythrocytes or leucocytes, but Morawitz (10) was the first to isolate them through fractional centrifugation. Bordet and others had also shown that the blood-platelets could stand a temperature of 100° C. for several minutes without losing their activity. Their rôle in blood coagulation was also well known. Bürker (11) and others were able to arrest coagulation by preventing the disintegration of the platelets. It is, therefore, believed that, in this process of disintegration a substance is liberated which brings about the ferment like elaboration of fibrin. Fonio is of the opinion that the platelets constitute the only element in the blood which furnishes thrombozym, but this belief is not universally accepted. In order to obtain blood-platelets, many technical difficulties had to be surmounted. The process of separating these elements can never be an easy one as their chief characteristics are their viscosity and vulnerability. Through fractional centrifugation of mammalian blood Fonio succeeded in obtaining platelets free from all other blood elements.

The details of this process have not yet been published. A cell-free preparation of thrombozym was obtained by extraction which was sterilized by heating to 100° C. for fifteen minutes and then placed in ampoules ready for use. To this preparation, which intensifies and accelerates coagulation both *in vitro* and in the living, the name of Coagulène Kocher Fonio was given. It retains its activity after heating to 95° C. for fifteen minutes, and is soluble in alcohol, chloroform, water normal salt solution, etc. As prepared at present for commercial purposes (through the courtesy of Dr Fonio I was able to obtain fifty grams of the powdered preparation from the "Gesellschaft für Chemische Industrie in Basel, Switzerland") it comes in the form of a granular substance having a sugar basis, and is simply dissolved in sterile water and boiled for five minutes. The strength of this solution, as recommended by Fonio, is either five or ten per cent. Once dissolved, the preparation must be used within twenty four hours as it rapidly loses its activity.

In a large series of tests *in vitro* Fonio con-

clusively proved that animal coagulène hastens the process of coagulation at all stages, and that, once coagulation begins, it rapidly becomes complete. He found on the contrary that human coagulène only hastened the end-process of coagulation it having no effect on the initial stage. The effect of coagulène on fresh wound surfaces was found to be more rapid than *in vitro*.

Technique. One gram of coagulène is dissolved in 30 ccm. of sterile water and boiled for five minutes. The solution can be sterilized in the autoclave but it has seemed simpler to me to place the liquid in a glass container (an ordinary Mason jar answers the purpose very well) which is partially immersed in boiling water. Both the solution and the jar must of course be warm before plunging the latter in boiling water. It will be noticed that the fluid is slightly turbid containing small undissolved particles. It is not necessary however to filter even for intravenous injection. Aspirate the coagulène in a syringe and place it on the instrument tray ready for use. Having made the skin incision, clamp or compress the larger blood-vessels momentarily then apply a few drops of coagulène and wait until coagulation has occurred before proceeding. Experience has shown that the thrombus in the larger blood-vessels may not hold therefore it is preferable to ligate them immediately. The incision is then continued through the deeper tissues, coagulène being instilled whenever needed. Two very important postulates must be remembered the first is that coagulène must be applied at the very site of the bleeding, on the oozing surfaces of the wound the second is that the coagulum, once formed, must not be wiped off by sponges or otherwise because in so doing the small thrombi are pulled out of the vessels and the bleeding reappears.

The only action of coagulène is to accelerate and intensify the normal process of thrombus formation. Crushing of the larger arteries by means of hemostats assists in the thrombus formation. Adrenalin may also be used to reinforce the action of coagulène by its vasoconstrictor effect. In laparotomies, the most important field of usefulness has seemed to be in those cases requiring the freeing of adhesions, old or recent. In this type of case, coagulène is an ideal substitute for the hot laparotomy pad or tamponade. A few drops of the solution applied directly to the oozing surface will enable the surgeon to continue his work unhampered by gauze pads or repeated and annoying sponging by his assistants. In the closing of laparotomy or herniotomy wounds, coagulène prevents the formation of that *lâche*

moie of the surgeon—the subcutaneous or subfascial hematoma.

In bone operations the use of coagulène is especially valuable inasmuch as it checks the constant oozing of bone and surrounding tissue, thereby avoiding the necessity of repeated sponging. In a recent personal communication from Dr Fonio (January 1914) he states that coagulène has given the best results in bone operations, strumectomies and craniotomies. The Koecher clinic is also, at present writing, using coagulène in skin-grafting, in hemophilia, in moptysis and gastroduodenal hemorrhages. A monograph on its intravenous use is shortly to appear from the same source.

That wounds will heal more rapidly and with a minimum of connective-tissue cells between the cut surfaces, in the absence of capillary oozing, is self-evident. Fonio believes that wounds on which coagulène has been applied heal more rapidly than those not so treated. I am not, as yet, prepared to confirm this statement which, *a priori*, seems logical. It is certain that the accurate coaptation of homogeneous tissues and the elimination of blood-clots which would tend to separate these tissues is a surgical desideratum.

In rhinological and laryngological operations coagulène is used in the form of a ten per cent spray or sponges, soaked in the same strength solution, are applied directly to the bleeding surfaces. H. Obermiller (13) found the solution very excellent in checking secondary hemorrhages following turbinectomies or septum resections. After the application of ten per cent coagulène he was able, with perfect safety to send his patients home without applying nasal tampons. Used in spray form after adenotomies and tonsillectomies, it brought about efficient and prompt coagulation. Owing to the pleasant sweet taste of the solution, Obermiller used it as post-operative gargle for children. Equally favorable results were obtained in the radical operations for antrum of Hildmore disease for ethmoiditis in the excision of papillomata of the larynx or extirpation of the epiglottis. In all of these types of operation the field of operation is kept free from capillary oozing, and tamponade, where previously indicated, becomes unnecessary.

PERSONAL EXPERIENCES

CASE. Epilobectomy Laparotomy September 23, 1913, Cook County Hospital. Coagulène used in abdominal incision. Capillary oozing ceased within few seconds, lasting per incision.

CASE. Cholecystectomy, September 2, 1913, Cook County Hospital. Gall-bladder freed from old adhesions;

capillary oozing rapidly checked by means of coagulène. Primary union.

CASE 3. Congenital multilocular cyst of right kidney September 5, 1915, Cook County Hospital. In this case coagulène was remarkably useful. After opening the entire kidney from pole to pole and evacuating the cysts, con. of 5 per cent solution of coagulène were poured in the cavity. A large coagulum formed within minute, effectively checking all hemorrhage. One rubber drain was left in the kidney substance for twenty-four hours. Patient made an uneventful recovery.

CASE 4. Angioma cavernosum of the right iliac fossa, September 7, 93 Cook County Hospital. An exploratory laparotomy was performed, but, in view of the size and extent of the angioma, excision was not attempted. Coagulène was freely used throughout the operation and controlled hemorrhage with perfect satisfaction.

CASE 5. Ravenswood Hospital, October 913. Retrovagina uteri, ovarian cysts chronic appendicitis. In this case numerous adhesions were loosened, coagulène controlling the capillary oozing with marked rapidity. Normal recovery per primam.

CASE 6. Ravenswood Hospital, October 8, 93. Traumatic bi-lingual hernia. Following the experience of the Kocher clinic, I ligated the superficial epigastric arteries and veins, coagulène checking the bleeding from smaller vessels. Normal recovery primary union.

CASE 7. Ravenswood Hospital, October 913. Encysted abscess of right mamma. Excision coagulène thrombo-formation, closure without drainage. Normal recovery.

CASE 8. Cook County Hospital, October 4, 93. Deplectomy three weeks after exploratory nephrectomy for traumatic rupture. Hemorrhage from adhesions was very profuse and annoying, but readily controlled by coagulène. General peritonitis was, however already present, and patient succumbed to the infection and sepsis seven days later.

CASE 9. Angioma cavernosum of face October 14, 93. Cook County Hospital. This tumor the size of an English shovell, was situated on the right cheek opposite the external auditory meatus. It was extremely vascular and had recently become infected. Instead of applying the coagulène on the lesion, I experimentally plugged the syringe needle under the base of the angioma and injected few drops of the solution: various points in its periphery. The ease with which the tumor was excised and the almost total absence of hemorrhage which was encountered during the succeeding steps of the operation are quite convincing of the efficacy of this method. Normal recovery.

CASE 10. Carcinoma of colon, October 6, 93 Cook County Hospital. The ascending and transverse colon and six feet of ileum formed an inoperable mass. Adhesions were at first freed, but as the ileum was found to be the seat of metastatic growth, the entire mass was removed the descending colon closed at the sigmoid flexure and the normal free end of the remaining ileum implanted in the sigmoid. Throughout the steps of this tedious operation coagulène was valuable aid in checking hemorrhage. The patient died of shock sixteen hours later.

CASE 11. October 3, 93, Cook County Hospital. Fracture of olecranon process of left ulna, open repair. Coagulène applied to oozing bone and (facial) surface. Increased closed flitch drainage. Normal recovery without post-operative hematoma.

CASE 12. October 3, 93 Cook County Hospital. Ventral hernia. Repair by vertical imbrication. Coagulène was used throughout the operation with perfect satisfaction. Normal recovery.

CASE 13. October 3, 93, Cook County Hospital. Double fracture of left humerus with irreducible forward displacement of distal end of lower fracture. Lane plating of lower fragments. Coagulène was freely used on the oozing bone surfaces with very marked satisfaction. Incision closed without drainage. Healing per primam. Three and half weeks later musculospiral paralysis appeared, due to compression of the nerve in the callus of the upper fracture.

CASE 14. November 4, 93, Cook County Hospital. Amputation of right leg. Coagulène gave ample satisfaction, checking both bone and muscle oozing. Normal recovery.

CASE 15. November 9, 93 Cook County Hospital. Right inguinal herniotomy. Superficial epigastric artery and vein ligated, all other bleeding surfaces controlled by coagulène. Normal recovery. Healing per primam.

CASE 16. November 9, 93, Cook County Hospital. Stricture of rectum colored female, 30 years old. Excision through posterior vaginal incision with anastomosis of bowel ends. Coagulène freely used to control the profuse venous hemorrhage encountered, thereby greatly facilitating the operation. Secondary infection with retrovaginal fistula occurred. Patient was operated upon second time by colostomy, but eventually died of sepsis.

CASE 17. January 14, 914. Cook County Hospital. Right oblique inguinal hernia previously cured by the injection of paraffin, the removal of which, with its surrounding adhesions, provoked considerable hemorrhage. Coagulène was promptly efficacious. Normal recovery. Healing per primam.

CASE 18. January 14, 914. Cook County Hospital. Left oblique inguinal hernia. Coagulène relied upon to check all bleeding with the exception of the superficial epigastric vessels, which were ligated. Normal recovery. Healing per primam.

CASE 19. January 14, 914. Cook County Hospital. Retrodislocation of right clavicle. After several attempts at reduction had failed, the acromioclavicular hyaline was reached by semilunar incision, the clavicle replaced and ligament sutured. Coagulène freely used to check hemorrhage. Closure without drainage. Normal recovery. Healing per primam.

CASE 20. Miss T. C., age 10. Purpura hemorrhagica Werthof. Through the courtesy of Dr. R. R. Ferguson of Chicago, I was allowed the privilege of using coagulène intravenously. Dr. Ferguson's notes are as follows: On December 9, 1913, patient returned home from school feeling tired and complaining of weakness and pain in the epigastric region. Temperature 97° pulse 54 respiration 18.

Treated symptomatically by some other physician for one week. December 9, 913, hemorrhagic spots appeared about the elbows and knees. The abdominal pains continued. Patient was restless and slept poorly. Hemorrhage from the nose, bowels, and vagina. Edema of lower extremities, blood and albumin in the urine. Abdominal pains appeared case after onset of necrosis. Entered Ravenswood Hospital, January 5, 914. Examination. Face bloodless and slightly cyanotic, radial pulse thrready. Blood flowing from nose, vagina, and rectum. Temperature 90 pulse 30 respiration 24. Patient feels very sick and exhausted.

With the assistance of Dr. Ferguson, the left internal epigastric vein was freed, the tip of Scarpa's triangle. The patient was so emaciated that compression of the upper extremities did not cause any visible filling of the neck. Basilar or median cephalic veins hence any section of the internal epigastric vein. A five per cent solution of coagulène was freshly prepared, sterilized and cooled to body temperature. Ten con. of normal saline

were first injected, then 300 ccs. of five per cent coagulase, followed by approximately fifteen ccs. normal saline solution — 300 ccs. of fluid in all. It was noted at the time that the child could actually feel the warm solution flowing up the left iliac and inferior vena cava, as she called attention to the fact!

Twenty-four hours later the hospital record was as follows: Temperature 98° pulse 94, respiration 18. Nasal and vaginal hemorrhages have ceased. Some bloody stools in stools which, however are formed and yellowish in color.

This improvement continued for three or four days, when hemoglobinuria became marked. As I had practically exhausted my available supply of coagulase the injection could not be repeated. A dehydrated horse serum was used but no improvement was noted. At present writing (February 4, 1914) general anæmia is present and hemoglobinuria continues. The bloody stool have ceased. The child is now evidently losing ground.

This case is cited to show that, in order to permanently check hemorrhages due to metabolic changes, repeated doses must be given. The immediate results obtained are encouraging and arrest further clinical studies along the same lines.

Numerous blood-coagulating substances have already been offered to the profession, principally it is true for the treatment of hemophilia. Woodrige (14) was the first to show that alcoholic extracts of any kind of protoplasm had coagulating power. Bernheim (15) demonstrated the blood-coagulating power of an extract of blood-vessel walls. Von der Velden (16) discovered that 5 to 15 gms. of sodium chloride per cc increased the coagulating power of the patient's blood. Stronthon lactate calcium chloride and gelatine have in the past, had their advocates. Well (17) was the first to inject fresh horse serum in the treatment of hemophilia, and Sahli (18) in 1910 successfully used antitoxin of diphtheria for the same purpose. The advantages of Coagulase-Kocher-Fondo over any of the preceding methods which at once suggest themselves are

1. In powder form it is a stable solution. (The exact length of time during which it retains its maximum activity has, of course, not yet been determined. I recently used the last gramme of coagulase in my possession on a tonsillectomy and found the solution normally active after five months. It is therefore certainly stable enough for practical purposes.)

2. It is readily prepared.

3. It is sterilizable without losing its activity.

4. It is available for local subcutaneous, and intravenous use.

5. On both theoretical and clinical grounds it is the most powerful coagulant at our disposal.

An unbiased critique of my twenty cases, added to the seventy-five cases reported in the Kocher clinic, convince me that in coagulase we have a preparation the employment of which tends to

shorten and simplify our operative technique. Fewer ligatures are needed and capillary oozing is reduced to a minimum therefore it would seem that primary union ought to be more readily obtained. A vast field is open, and the theoretical possibilities of this preparation loom large. Clinical reports on its use in hemophilia, pulmonary hemorrhage, hemorrhagic pancreatitis, bleeding gastric or duodenal ulcers, etc., are still lacking. My single experience with the intravenous injection of coagulase in purpura hemorrhagica was encouraging, but the insufficient quantity of the substance at my disposal prevented me from repeating the dosage. The Kocher clinic has also begun using coagulase intravenously but reports are not yet available.

The writer feels sufficiently encouraged to pursue further investigations as soon as a fresh supply of coagulase is available and is at present confident that a useful and serviceable adjunct has been added to our surgical technique.

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A BRIEF CONSIDERATION OF SOME RECENT TESTS
FOR GASTRIC CARCINOMA

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THIS paper is simply a very brief consideration of a few of the more important tests for gastric carcinoma, and incidentally for carcinoma in general, which I have selected from the large number of tests proposed, and with which recent literature is filled. I have nothing original to offer and my only apology for approaching a subject on which so much has already been written is its importance, and the hope that a brief description of a few of these tests might prove of general interest.

Early diagnosis in cancer of the stomach is an absolute necessity if we are to be of any real assistance to the patient, and anything which can in the slightest degree contribute to this early diagnosis cannot be neglected. The duration of life in this condition is very short after the disease is so far developed that the diagnosis is plain the average duration of life is only one year. When this stage is reached palliative treatment is alone possible.

The difficulty of this early diagnosis has led numbers of investigators, in the last few years, to seek new and improved methods by means of which the diagnosis can be made with certainty in the early stages. The solution of the question has been approached in many different ways — by some, through an investigation of the stomach contents and urine by others, through serological methods. The X rays also play a significant rôle and lately have done much to advance our knowledge of diseases of the stomach. Nevertheless, none of the many methods has realized the highest hope. Therefore, the fact remains that new investigations will always be undertaken, in order to gain a nearer approach to the difficult problem. Numerous demonstrations show almost without exception that none of the tests gives results which are pathognomonic for the disease in question and their interpretation is, on that account, of not much greater value than any of the other clinical symptoms.

The test which above all others is probably the most widely known and used is the glycytryptophan test of Neubauer and Fischer, and its modifications. As originally proposed, in 1909, the test was very simple, and could be used by any practitioner anywhere. It consisted in mixing glycytryptophan, a polypeptid, with a portion of filtered gastric juice obtained after the

usual test breakfast, incubating for twenty four hours and then testing with bromine vapor for the rose violet color of free tryptophan. Their conclusions were as follows:

1. There exists in carcinomatous stomachs a ferment, which contrary to pepsin, will split glycytryptophan.

2. This ferment is destroyed by an acidity of 36 per cent HCl (equivalent to about 93 degrees of acidity as ordinarily determined)

3. The presence of this ferment may be of diagnostic value.

Their report was accepted with widely divergent criticism. Many investigators took up the study of the method and obtained different results.

One of the most frequent criticisms is the fact that it was found that the gastric contents of normal individuals, as well as of non-cancerous patients, under certain conditions, was capable of splitting glycytryptophan and other polypeptids. As an explanation of this fact, it is generally believed that the ferment causing this peptolytic cleavage belongs to the general group of ereptases, ferments capable of splitting polypeptids and peptones, but incapable of attacking native proteins. No specific action on the part of the ferment in cases of carcinoma has been observed, so far as the above cleavage is concerned therefore, a test of this sort possesses specificity only in so far as it can be shown that the ferment present is derived solely from the carcinomatous tissue. This introduces a number of sources of error and in order for the test to possess the slightest value ereptases, or ferments from the following sources must be ruled out:

1. Ereptase from regurgitated duodenal contents.

2. Ereptase from hemorrhage into the stomach and from transudation of ereptase-containing fluids into the stomach.

3. Thromb ereptase from breaking down of cells of the gastric mucosa.

4. Ereptase in swallowed saliva.

5. In addition, protease, capable of peptolytic cleavage, as well as of proteolytic cleavage may be present from the trypsin of regurgitated pancreatic juice or from bacteria and leucocytes, mostly from swallowed saliva, and must be controlled.

Naturally under these circumstances, the test becomes very difficult technically and is not available for use by the general practitioner.

However, Friedman and Hamburger in a recent communication, have so modified it that it holds promise of results, and more general applicability. They consider that, of all the above enumerated sources of error, the proteases of regurgitated pancreatic juice and the leucocytes and bacteria of saliva are the most active. They control these by the use of the vegetable protein *casein*, which is attached only by proteid splitting ferments. They also use peptone in place of glycyrrhizin, which has been shown to be equally as good. Both peptolysis and proteolysis now come into consideration, whereas in the original test it was only peptolysis. High peptolysis with low proteolysis speaks for carcinoma, high peptolysis with high proteolysis against carcinoma. Under these circumstances, they think that the test possesses distinct value in the diagnosis of cancer of the stomach, and is of considerable service in the differential diagnosis between benign and malignant acidity, but is of practical value only when taken in conjunction with the usual clinical and laboratory findings.

After all criticisms have been made, and sources of error ruled out, the fact remains that the gastric juice from cases of carcinoma in most cases undoubtedly shows a higher peptid splitting power than that from normal or non-malignant cases, and the routine employment of the test originally described can do no harm, although no dependence can be placed upon it alone. But in conjunction with other clinical findings, it is a small link in the chain of evidence.

Another simple test has been suggested by Oppenheim. I have been able to find but very little on the subject in the literature at my disposal, and consequently cannot give any opinion as to its value. It consists in adding three per cent acetic acid to the filtered gastric contents, a drop at a time. If the reaction is positive, a turbidity or cloud appears which vanishes only after considerable acetic acid or a little HCl is added. Dilution with an equal volume of distilled water does not cause the cloud to disappear. The only source of error is mucus, which also gives cloud with acetic acid, but this cloud is unaffected by the addition of HCl and does not occur in high dilutions of the gastric contents. The filtrate must be absolutely clear. The test may be applied to vomitus, and blood and pancreatic juice are not disturbing factors. Oppenheim has made comparative tests, and finds the above reaction positive in all cases in which the gly-

cyrrhizin test is positive. He is unable to determine upon what the reaction depends.

Still another test which has been proposed, in which stomach contents are used, is based on the presence of hemolytic substances in the gastric juice. Grafe and Roehmer first undertook this investigation, carrying on, in a way, the work of other men who had demonstrated the presence of hemolytic substances in extracts of organs and malignant tumors. The gastric juice rendered feebly alkaline was extracted with ether. From the residue, after evaporation of the ether, an emulsion was made with normal salt solution. This emulsion was then mixed with a suspension of washed rabbit corpuscles. The extract from carcinomatous gastric juice dissolved the red blood-corpuscles, a reaction which did not occur with benign diseases of the stomach, or in healthy persons. Upon further investigation, however, the test was found to be of little value for several reasons: the technique was too complicated and difficult for ordinary clinical use, the presence of tryptin in appreciable amounts also led to hemolysis, and in high-grade gastritis, on account of the large amount of water necessary for washing, the hemolysin was so diluted that hemolysis did not take place.

Through chemical analysis, it was determined that the hemolytic action was due to oleic acid. Grafe tried to simplify the method by determining the quantity of oleic acid by titration.

But after many trials of both methods, by many investigators, the conclusions of the majority seem to be that they possess little value, as hemolysis and high oleic acid content are found in many benign affections, and in health, and are often not found in cases of carcinoma.

These tests just described are typical and are among the most important of those which deal directly with the stomach contents, and are the ones over which most of the discussion has been. When all is said and done, they fall far short of furnishing the infallible test for gastric carcinoma which is the ultimate aim of all investigators. Of course much work has been done toward refinements of the older methods of gastric analysis which cannot be discussed here. More stress is laid by some upon the finding of occult blood in the gastric contents and stools than seems formerly to have been the case. Zieppert states that the repeated finding of occult blood in the stools day after day provided all extraneous sources of blood are ruled out, is the one sign among all others which is characteristic of benign gastric carcinoma. In no other condition is it so constantly present.

But, in general, very little real advance has been made in gastric analysis. A large amount of information has been gathered, but it consists mostly of disconnected facts, and their general bearing on any one subject, and particularly on the one under discussion, is not yet clear.

We have now to consider the investigations which have been made concerning the general reactions and perverted metabolism of the organism in cancer.

Salkowski found that in the urine of patients suffering from carcinoma the percentage of nitrogenous matter precipitated by the metallic salts to the total nitrogen was greatly increased. While normally the so-called colloidal nitrogen amounts to about 3.5 per cent of the total nitrogen, in carcinomatous urines it was between 8 and 9 per cent. Later investigations gave the same results, which were confirmed by a few others.

Following this, many observers tested the method with varying results. It was found that a large number of diseases, in addition to carcinoma, showed an increase in colloidal nitrogen notably chronic infectious processes, tuberculosis, heart insufficiency and liver diseases. There were many differences of opinion regarding the percentage relationship in carcinoma. A few observers found no increase, but an actual decrease. On the other hand, many agreed perfectly with Salkowski, Caforio stating that carcinoma could be ruled out of the diagnosis if there was no increase in colloidal nitrogen.

Fever of Basel, from whose article I have obtained my information regarding this method, tested it in a large number of cases. He found that the reaction was absent in about one-third of the cases of undoubted carcinoma, and was present in a number of other diseases. However this latter fact alone does not detract so much from its value if it were always present in all cases of carcinoma, because in most of the other cases the diagnosis presents no especial difficulty with the exception of pernicious anemia and some liver diseases, which are often difficult to differentiate from malignant disease.

He concludes that an increase in colloidal nitrogen occurs in all cachectic conditions, and that it speaks for carcinoma when all other causes of cachexia can be ruled out, such as chronic infections, tuberculosis, and heart and liver disease. A normal percentage, however does not by any means exclude carcinoma.

Another and simpler urinary reaction, which is along the same lines as the preceding, and dependent upon the same principle, is the sulphur

reaction of Solomon and Saxl. They find that the urine in carcinoma is fairly rich in incompletely oxidized sulphur which sulphur they oxidize and determine the quantity of sulphate resulting. The general principles of the method in brief are as follows. The sulphates are removed with baryta solution the ethereal sulphates by digesting with HCl and the filtrate treated with hydrogen peroxide, and boiled. It is then placed in a conical glass. If positive, an abundant precipitate occurs within one-half to four hours. Normal urines do not give this precipitate in that length of time, or at most, only a trace. Any precipitate occurring after four hours is disregarded.

The literature contains many references to this test recently the great majority of writers speaking very enthusiastically of it, although a few say that it has no value whatever. The general opinion, however seems to be that it is positive in a large proportion of all cases of carcinoma.

Certain Italian workers, notably Ascoli and his pupils, have presented a serological reaction for cancer based upon certain principles laid down by Ehrlich and also upon certain laws of physical chemistry by means of which they seem able to identify antibodies in the serum of the individual tested, when a specific antigen is employed.

In brief the method consists of extracting the essential principles of the antigen specific organisms, or diseased tissue being used, as the case may be, and adding this extract to the serum of the patient to be tested. The surface tension of the mixture is then ascertained. This is measured by the number of drops contained in a certain amount of the fluid, estimated by means of an instrument known as the stalagmometer of Traube.

The mixture is then allowed to incubate at body temperature, and at the end of a definite time the surface tension is again estimated. If it is increased the number of drops in the same amount of fluid will be increased.

Ascoli claims that this increase will occur in every case in which an antigen is incubated with a serum containing an antibody and claims a high degree of specificity for the reaction particularly brilliant results being obtained by him in malignant disease. It occurs not only in malignant disease, however but also in other conditions, such as typhoid, syphilis, tuberculosis, and most infective diseases.

As with the other tests, opinion as to the value of the diastagnine reaction, as it is called, varies greatly but a large number have confirmed

Ascoli's results, and the method, if simplified, would seem to hold promise. The technique, however, is at present much too complicated for general use.

Only a brief mention of other tests which have been proposed can be made here.

Recent developments in Abderhalden's biologic test seem to promise something, especially in determining the organ involved. The phenomena of anaphylaxis have been utilized to a slight extent as a means of diagnosis, but no definite ground has been reached. von Dungern has suggested a complement deviation reaction, which was claimed to be specific, but later researches have shown it not to be so. Sturrock finds the alkalinity of the blood increased in cancer, and on this finding alone feels justified in exploratory operation. His results have not been confirmed. The skin reaction proposed by Elberg, Neubof and Geist has been found not to be specific, but a positive reaction is strong presumptive evidence of cancer.

One agent which is rapidly coming into prominence in the diagnosis of gastro-intestinal conditions is the X-ray. It is of course valuable only as an adjunct, as the diagnosis cannot be made upon the X-ray findings alone. But in the hands of experts it promises much. Serial skiagrams are necessary in order to be at all certain in any case.

In expert hands, too, the gastroscope is exceedingly useful, in many cases enabling an early and exact diagnosis, without the employment of any other means. Its employment is rapidly becoming more extended, and in the near future we may hope to see it in fairly general use, instead of being confined to a few.

The above are only a few of the many tests and methods which have been proposed in recent years. To discuss them all, would take too long. They fall naturally into three groups.

1. Those dealing with the stomach contents.
2. Those dealing with the urine.
3. Those dealing with serological reactions.

A fourth group might also be added, containing those agents other than tests directed toward the organism and its metabolism, as, for example, the X-rays and the gastroscope.

The above described are fairly typical of each group. Of these groups, the one which would seem to promise the most theoretically is the third. It is reasonable to suppose that the blood of patients suffering from malignant disease would contain a substance or substances not present in the blood of normal individuals, and the large number of able investigators who are at work on the problem would lead to hope that in the near future some specific test will be evolved.

But we must conclude that the test which fulfills the long felt want of an early specific diagnostic means for carcinoma is yet to be discovered, and that so far as the general practitioner is concerned, recent years have not helped him much. Because those few tests which do supply a small degree of confirmatory evidence are too complicated and too difficult technically except for those specially trained and with exceptional laboratory facilities.

Considering these things, it would seem that in cases of stomach disturbance presenting symptoms which lead to a suspicion of cancer the patient should be told the exact state of our knowledge on the subject. The dangers of delay should be dwelt upon, and the individual given the opportunity to choose between uncertainty and an absolute diagnosis, which can be obtained only through an exploratory operation. The risk is small, and the information is definite. If the condition is found to be inoperable, the patient will have suffered but little additional pain and discomfort.

TRANSACTIONS OF SOCIETIES

CHICAGO SURGICAL SOCIETY

A REGULAR MEETING WAS HELD MARCH 6, 1914, WITH THE PRESIDENT DR. M. L. HARRIS
IN THE CHAIR

Dr Edward J Lewis (by invitation) read a paper entitled "Preliminary Report of Experimental Bone Transplantation. (See p 572)

Dr Edwin W Ryerson (by invitation) read a paper entitled The Transplantation of Bone in Pott's Disease. (See p 578)

Dr E. J Brougham and Dr A. C. Ecke (by invitation) contributed a joint paper entitled A Preliminary Report on the Treatment of Fractures by Fixation with Animal Bone-Plates and Bone Screws. (See p 63)

Dr H. B Thomas (by invitation) read a paper entitled Bone Transplant. (See p 580.)

DISCUSSION

All of these papers were discussed together. Dr. WILLIAM HINERST Bearing upon the subject of bone transplantation I have had a patient come here to-night who represents a typical case of osteomyelitis, followed by necrosis, resection, transplantation with a pretty fair result.

This boy first came under my observation in September 9. He had been sick five days with classical history of osteomyelitis—sudden onset, excruciating pain, fever, white chills, and all the symptoms of sepsis. After five days his leg presented the typical appearance of swelling, extreme tenderness, and central fluctuation. An incision was made on the anterior aspect of the tibia; pus was found in the soft tissues and under the periosteum. At that time I opened into the medullary cavity. The suppuration subsided, the acute symptoms subsided, and the boy became immediately better and after six weeks the lower epiphysis had become loose.

A question of practical moment is, How long shall we wait when we have complete necrosis of the shaft of the tibia before removing the necrotic tibia? Shall we wait until the tibia becomes loose, or shall we take out the necrotic bone early? I waited five weeks and the lower epiphysis having loosened up I determined on resection inasmuch as the osteomyelitic process was limited to the lower half of the bone. The entire shaft of the bone did not become necrotic,

due to fairly early intervention. How much of this necrotic tibia are we to remove? In other words, how can we tell how much to remove? Does it make any difference whether we remove quite a bit of healthy bone there being no line of demarcation? I was more or less guided by the formation of an involucrum, and from this point the periosteum was not thickened. I severed the bone at that point, and whether that is correct I should like to have some expression of opinion. That was what guided me as to the point of resection.

The subsequent history was uneventful. The wound healed up completely in about a month there was no sinus, and I waited in this case for about a year and there was no regeneration. After six months I advised transplantation but his family was opposed to it, and they waited for another six months, and during the greater part of that time the boy was around without a cast, and as a consequence the fibula became partially dislocated. After a year there was no regeneration. I was able to identify the periosteum in this subperiosteal resection, and thought at the time of the resection there was some regeneration but the first picture shows there was very little. After a year a typical transplantation was made. A piece of bone eight inches long was removed from the left tibia, and three-quarters by one-half inch thick. I used the chisel and it worked nicely. With a sharp thin chisel one can chip off the desired length. This shows the site of transplantation and has regenerated so that he again had a sharp tibial margin here.

The pictures shown illustrate the appearance of the bone subsequent to the first operation. For the next year or so there was just a little projection from below and a slight one from above. This shows the site of the removal of the graft. This shows the graft in place shortly after it was inserted and the subsequent pictures were

taken within six months after the transplantation, showing adhesion of the transplant to the tibia, the transplant having been removed in the manner indicated with a chisel, which is more or less crude as compared with the saw but it can be done with fair accuracy with a thin, sharp chisel without the danger of spoiling the graft.

The ends of the bone were squared off. The graft was driven into the medullary cavity above and fastened below with wire. I believe that the bone-graft does not die. I have nothing but clinical evidences, but from this and my study of the literature I believe it is a fact that the bone-graft does not die. I am convinced that when a bone is transplanted a great number of the osteoblasts remain living and retain their function and that they contribute toward the growth of the bone. This graft has grown somewhat. Subsequent to the transplantation the course of the clinical history has been uneventful. I kept him in a cast for four or five months and since that time he has been walking. He went around for nearly six months with the absence of the bone there, with nothing to support it, and forced it into this position; at the same time the result is pretty fair.

I simply present it as a case of transplantation of bone following resection for osteomyelitis.

DISCUSSION

DR. ARTHUR DEAN DEAN. We have all profited very much by this symposium on bone transplantation.

In regard to Dr. Lewis' paper it is the clearest, most common sense presentation on bone grafting or bone transplantation I have listened to. I say that because it is entirely in keeping with my own conception of the facts. I never had any question in my mind but that exactly the same laws controlled bone grafts that control a Thiersch graft or a graft of fascia that we simply have to look to exactly what happens in the transplant of a Thiersch graft or of a graft of fascia to determine what takes place in bone. I believe bone is simply a mesoblastic structure, peculiar to be sure, and that the peculiarity lies in the osteoblast, which has the power of reproducing mesoblastic connective tissue of that particular form called bone, and that the whole subject of the success of the graft and its condition depends upon the life of the osteoblast. If the osteoblast is placed in a condition where, as Dr. Lewis states, it can receive the proper blood supply, favorable conditions for life and growth, it will live.

The experiments he has detailed are interesting

to me, and particularly those relating to cutting these bone fragments into a great number of pieces and transplanting them and demonstrating beyond any question of doubt the fact that they do live—that the osteoblasts do live and do develop into bone. This is especially shown in the case where he cut off the ends of the radius and turned the lower end of the radius into the joint. There can be practically no doubt but that the bone graft does live in that particular case.

I am very much interested in Dr. Ryemon's work, and particularly in the very practical motor saw which he has demonstrated to us this evening. It seems to me it is the most successful instrument I have seen for work of this nature.

In regard to the bone-plates, I cannot quite agree with the authors who presented this subject. The bone-plate presented seems to be an admirable device. I want to say in that connection in regard to Dr. Thomas' paper that I think he is incorrect in the statement that forty-eight per cent of the Lane bone-plates suppurate and require removal under favorable conditions the percentage of suppurations in steel plates, properly introduced, would be very small—so small that there is hardly a fair comparison between the cases which he presents of transplanting bone into a vertebral column or any other position without any suppuration. The whole question is one of technique and of the condition of the tissues in which you make the transplant. Certainly under favorable conditions a surgeon who has ten per cent of cases that suppurate in using bone-plates would be very culpable. I cannot say offhand, but I do not believe in my own bone-planting we have had anything like five per cent of cases in which there has been any infection of any kind.

In our own work in the femur we practically never remove a steel plate. In the tibia it may seem advisable in some cases to remove the plates where it is advisable we do so, and regard them simply as temporary matter. They can be easily removed under a little local anesthesia and with very little difficulty. My own impression is that where we need a plate of any kind, a steel plate in fractures would be better than a bone plate such as that presented, although I think these bone-plates should have a fair trial.

DR. CHARLES DAVISON. I have been very much interested in this work. I have watched very closely the work that has been done in the County Hospital, particularly the Albee operation, and the results seem quite wonderful. The children there go from bad to worse by the old treatment.

One point raised against the Albee operation is that the fixed bone-splint put in a child will not grow with the child that it will straighten the back up too much. These cases shown to-night, growing for a long time, would not indicate that.

As to the application of the Lane plate, the Lane plate is a foreign body. It is admitted by those who have been around the County Hospital, and have seen a good deal of the surgical work done there that many of the Lane plates that have been used have been subsequently removed, and there have been all sorts of results following the use of this plate. Three or four years ago, or shortly after the Lane plate was introduced in this country there was a steady stream of cases coming to the County Hospital with infection from Lane plates, or rather in those cases where Lane plates had been used. Some of these patients would come in for a day and have the limbs dressed, while others would come in to have the plates taken out. Still others would come in transit to the Oak Forest Infirmary. In the use of the Lane plate, when infection takes place, the screw holes make necrotic areas which are slow to exfoliate, and new bone built up around the plate takes a long time to get well. It seems the Lane plate is passing, as so many surgeons are using other devices for the same purpose. I am in favor of the autogenous bone splint in the medulla of the long bone, taking a little chunk out of the tibia and introducing it into the medulla of the bone. This can be done much quicker than a Lane plating. It is done quickly with a saw with very little shock to the patient, and the bone splint will slip in place easily and we have a splint which belongs to the body and which will be treated kindly by the body. It does not make any difference whether it stays there or becomes absorbed. It will remain there long enough for the fracture to unite. It probably will undergo the same process as a physiological medullary bone-plug after bone fractures. After the bones are knitted together, there will be gradual absorption and reopening of the medulla as time goes on.

The open operation for fracture of the long bones has a very brilliant future but I think it is being overdone. It is being used on bones that should be treated by simple splints, by simple reduction and fixation by ordinary splints. Any bone that can be successfully fixed by ordinary external splints should not be subjected to an open operation which is attended with the dangers of infection. A simple fracture of a long bone

can be fixed by a bone-peg taken from the tibia with better results than with any other device by open operation.

Dr. A. J. Ochsner. The scholarly paper read by Dr. Lewis certainly has great value and it is gratifying to know that such work is being done here.

The more we have seen of the Albee operation the better we have been pleased with it. The patients as a rule have shown great improvement.

Regarding the case that Dr. Hensert has shown us, I believe that if all the tissues had been split down to the bone from a point three or four inches above the place where the incision was begun down to the lower point at which the incision stopped, and the leg had been dressed for a year and a half, the patient would now have a leg infinitely better than he has. I have not seen as many of these deformed cases following acute osteomyelitis operations in recent years as I did formerly. Some twenty years ago a case came under my care with the metatarsal bone of the great toe entirely necrotic. I made an incision and wanted to remove the bone but was not permitted to do so. That patient still carries her metatarsal bone of the great toe and there is no shortening or deformity whatsoever. I have seen the tibia necrotic for more than one half of its length remain in place with the loss of only a small amount of tibial tissue. I have seen a number of cases like the one we have seen to-night in which new bone formed as a sequestrum by not removing the dead portion until later and invariably the result was much better than in the case just shown.

Regarding bone plating, I would like to say this. No one should plate bones unless he knows how. If bones are plated right, it is one of the best operations in properly selected cases that can be done. If you plate a bone wrong, it is one of the worst things you can do. In our work at the Augustana Hospital, Dr. Percy has had 108 consecutive cases in which bone plates were used with only five unsatisfactory results. The difference between the manner of applying these plates and those I have seen that were put on elsewhere and had to be removed later is precisely the difference between a thing done right and a thing done wrong. If one watches who do it right and those who do it wrong, it is a simple matter to see why in one case the patient has to come out and in the other cases they do not.

Dr. E. J. Bruckner. In regard to Bevan's statement that suppuration has been in only five per cent of the cases in which it has been used in his work, I would say

In private practice, where we do not have oxygen, I would be afraid to use these drugs.

I should be very grateful to Professor Krönig if he would tell us the exact time when he begins to use these drugs and the dosage. It is very essential that we should find some method by which we can diminish the pain of labor because I believe that the modern women cannot stand as much pain as the women of the past.

DR. ROBERT L. DICKINSON, Brooklyn, New York. As one who has used scopolamine-morphine and then abandoned the method because of the difficulty of resuscitating children as one who has visited Professor Krönig's clinic, and again taking it up under better instruction, I desire to speak on this subject although the new series of cases is not yet sufficient to determine whether our babies are in greater danger. We have oxygen always at hand. A distinction between the old method and the new has perhaps not been made by Professor Krönig but as I understood it at Freiburg there is an attempt made to have a definite interval of four or five or six hours between the last dose of morphine and the delivery of the child. Of course no man can tell just exactly what that interval is, but certainly in our experience giving morphine in the early part of labor as was taught in Freiburg last year by Professor Krönig has made a difference in the number of asphyxias.

DR. GUSTAV KOLLSCHNER. I think that Dr. Yarros struck a keynote when he said that the American woman of the higher class cannot be judged by the physical standard of the average women who are furnishing the material for the German clinics. But the untoward results of the scopolamine anesthesia that Dr. Yarros is reporting may be sufficiently explained by other factors also, the same factors that brought this anesthesia somewhat in dis-repute with most of the obstetricians here in Chicago. We saw collapses in the mothers and certainly an increase in the mortality of the babies. There are two instances that may be held responsible for that. Firstly the scopolamine that was at our disposal was a rather uncertain drug; the preparations on the market were of different strengths and were also unstable; they decomposed rather rapidly and some of the undesirable results were undoubtedly due to this changed quality of the drug. We were given to understand, however, that Professor Krönig's chemist furnished a preparation that is equally reliable in the whole output and is also absolutely stable. Secondly there is an essential difference between Krönig's dosage and the doses we were used to

administer. We, and so did Dr. Yarros, always injected one milligram scopolamine per single dose while as I understand it Krönig administers less than one-half of one milligram as a single dose. Neither scopolamine nor morphine is known to have an accumulative effect, so that the toxic effect of the first dose may have worn off before the next dose is given. If we give at intervals the same amount in two or three doses that we used to give in one dose, this point is sufficient to explain the difference between Krönig's and our results.

As to the radiotherapy of myomata of the uterus, a criticism of this method depends entirely upon the standpoint one is taking as to the remote results of operative interference in sarcoma of the myomatous uterus, and as to the primary mortality of myomectomy. If one believes that we are able to obtain definite cures by operating on myomata that have degenerated into sarcoma, then one may object to the indiscriminate radiotherapy of the myomata of the uterus. At the same time we have to admit the possibility that a sarcoma contained in a myomatous uterus may have been cured and may again be cured in the future by the influence of the X-rays or by mesothorium rays, or as we were recently told, by the action of a hundred thousand dollars' worth of radium.

As to the primary mortality of myomectomy I would like to call attention to the fact that conclusions based on statistics must always be taken with a grain of salt. While Krönig figures the total primary mortality to vary between four and five per cent, it still is a fact that some operators can look back on long series of operations without a single death. Dr. Frankenthal who is operating at the Michael Reese Hospital reported some time ago an unbroken series of 125 myomectomies without single death. Of course the objection may be raised that such an absolutely favorable series may be followed by a number of bad results but still facts are more convincing than mere theorizing.

There is one feature however that may help us out of these difficulties: modern laboratory work has developed a way of diagnosing malignancy that could not have been diagnosed by any other clinical evidence and that is the serum diagnosis of malignant tumors. If the promise held out by the laboratory men will come true, then all these dilemmas will be solved. In case the serum test points to malignancy the belief in the operative cure of uterine sarcomata will resort to the knife and will shun the radiotherapy. If on the other hand, the radiotherapeutist will have succeeded in making disappear a uterine

tumor under similar conditions, then his claim that malignant tumors of the uterus may be cured by hard rays without the risk of an operation will be definitely established, and if that is done a great step forward will be assured and for this enrichment of our therapeutic armament we will be indebted to the Freiburg clinic.

PROFESSOR KRÖNIG (closing the discussion) With reference to the remarks of Dr. Yarros, I will say that while the American ladies are more beautiful than the German ones, I do not think they show less resistance. I think the German and American women are about equal in that respect, because I have had the good fortune of having delivered quite a number of American women under scopolamine morphine narcosis without mortality incident.

Dr. Kofischer has stated that in former years the scopolamine was not a constant entity that it was liable to decompose rapidly and in decomposing it not only became inefficient but developed new and dangerous properties that endangered the lives of the children. In our first thousand cases we almost lost three women from the effects of decomposed scopolamine but since our chemist has been able to furnish us with a stable, reliable drug of equal strength, in three thousand cases we have not lost one mother. The mortality in children did not increase above the general mortality in the first year. Therefore, if Dr. Paddock's results differed so widely from ours, it is fair to assume that his technique must have differed somewhat from ours, or that he had the misfortune of using an unstable or decomposed drug.

As to radiotherapy in the treatment of myomata of the uterus, I would like to say that according to the statistics collected by us, the percentage of sarcoma in uterine fibromyomata is not more than one per cent. In fact, of those cases of myomata that were treated with X rays, we did not lose one case by sarcomatosis. Statistics show that of all cases that were operated radically for sarcoma of the uterus, 33 per cent were dead inside of three years, all of the patients having died from recurrence of the disease.

PROFESSOR DOCTOR GAUSE, Freiburg Germany, read a paper entitled Report of the Result of Radiotherapy in Gynecology.

DISCUSSION

DR. LEWIS S. McINTIREY, Louisville. My contribution to this symposium was an effort to present the development of the surgical treatment of uterine fibromyomata preparatory to the paper of Professor Krönig, to the delivery of

which we have just listened, in order that we might have a thorough presentation of the present status of the subject, and then be able to apply the suggestions that have been so ably and germanely presented. This is not the first time Mr. President, that an effort has been made to replace surgical methods by non-surgical methods in the treatment of uterine fibromyomata. Those present will remember the efforts of Professor Apostoli in this direction with electricity and of Dr. Keith after his great surgical triumph in this field, who abandoned surgery and adopted electrical treatment.

The difference in the suggestions made by Professor Krönig as to the non-surgical treatment is very marked. Professor Apostoli at the time he advocated this treatment had never successfully treated these cases by surgery while the other had abandoned surgery but here in advocating the treatment of these tumors by the röntgen rays we have a masterful surgeon, who has had experience in surgery, and who presents these facts to us. Those of us who have visited Professor Krönig in Freiburg, and have witnessed his work, can all realize that when he speaks on this subject we are listening to a master surgeon, consequently when he makes suggestions as to supplanting established surgical methods with another method, it commends itself to our careful consideration. It is certainly a very remarkable presentation of facts, and I am sure that we are all very greatly indebted to him for presenting this very scientific paper. Before this treatment can be properly tried, it requires one to master the technique as has been done by Professor Krönig and to conduct the treatment with the greatest care, precision, and with scientific accuracy.

I have no doubt, as a result of Professor Krönig's visit to this country this treatment will be thoroughly tested here and I trust with the most satisfactory results.

DR. ROBERT L. DICKINSON, of Brooklyn, New York, followed with a paper entitled "Efficiency Engineering Applied to Gynecological Surgery" which was illustrated by numerous stereopticon slides. (See p. 559.)

DISCUSSION

DR. RICHARD R. SMITH, Grand Rapids, Michigan. This is a very timely paper full of thought and suggestion by a man of large experience. Dr. Dickinson is, above all things, a practical man and he has that far-seeing imagination which makes for progress. I think we have all been pleased with the progress gynecology has made

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DR. GUSTAV KOLINCHER: I think that Dr. Yarros struck a keynote when she said that the American woman of the higher class cannot be judged by the physical standard of the average women who are furnishing the material for the German clinics. But the untoward results of the scopolamine anesthesia that Dr. Yarros is reporting may be sufficiently explained by other factors also, the same factors that brought this anesthesia somewhat in disrepute with most of the obstetricians here in Chicago. We saw collapses in the mothers and certainly an increase in the mortality of the babies. There are two instances that may be held responsible for that. Firstly the scopolamine that was at our disposal was a rather uncertain drug the preparations on the market were of different strengths and were also unstable they decomposed rather rapidly and some of the undesirable results were undoubtedly due to this changed quality of the drug. We were given to understand however that Professor Krönig's chemist furnishes a preparation that is equally reliable in the whole output and is also absolutely stable. Secondly there is an essential difference between Krönig's dosage and the doses we were used to

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such splendid surgery in these last few years that you have not stopped to think about our part of it, and the result of it is that in nearly every operating room I go into to-day there is the command of the surgeon to hurry hurry get this quick get that quick. We do not believe that the work is done in such a workmanlike manner from our standpoint that the best results to you are being obtained. I have seen in some parts of this country and know of places abroad where an operator will have but one assistant, one woman assistant or a man assistant, and he seems to go through his operation without any friction without any trouble. He operates quickly he gets through, and gets his patient back to bed, and nobody is worried at all. When we see that we wonder whether it is not a mistake to call for more people more tables, more wash basins, more instruments, and the infinitude of apparatus and detail so that you cannot move about in the operating room at all. Now I am not going to say whose fault it is. I do not know. That is not my business. But some of us a few years ago undertook to begin to ask that question. We have got to this point now and I am going to tell you very briefly what we have done. We have a hospital section in the American Medical Association. We had been working for some years in the American Hospital Association but we were not reaching the right people—the doctors—who eventually must direct the affairs in hospitals if they are to be conducted along scientific lines, and you may as well begin that direction now. You have not done it up to this time. As I have said, we have a hospital section in the American Medical Association, and we have a similar section in the American Hospital Association, which also has a committee. At the meeting of the Clinical Congress of Surgeons of North America a committee was appointed to cooperate with the other two committees, of which Dr. Codman of Boston was chairman. I am chairman of one committee and Dr. Hurd of Baltimore is the other chairman. Now we are going in all directions to see if we cannot get some inspection of hospitals with a view of establishing standards by which the hospital themselves may further their efficiency. One of these propositions was that the hospital people should undertake to inspect and standardize the hospitals themselves. That seems obviously impossible to be done. You cannot standardize yourselves. Then it was proposed that the American Medical

Association should begin standardization and do this work. And again it came up, but the doctors are really the people who are at fault and they cannot standardize themselves very well. Then the proposition came up that inasmuch as the Carnegie Foundation had done such a brilliant piece of work in connection with medical education it should undertake this work. That proposal is still in the air. Then again, the proposition came up to ask the United States Public Health Service to make an inspection of a certain class of hospitals with a view to establishing these standards. Just what we are going to do it is impossible to say. We are going to do something. The hospitals are going to have some help.

I receive letters every day asking what is the ethics of this, what is the standard of that, and what is the technique of the other? I do not know because in the hospital with which I was connected for some years, I found that one surgeon wanted one thing done in one way and he needs five nurses and three internes another surgeon wants it in another way although he has less assistance and more apparatus so that there is no head nor tail to it, and we are trying to get something out of the chaotic condition in our hospitals of to-day. This does not confine itself at all to the surgical department. It goes into every part of the hospital administration, organization equipment and architecture. I bespeak for this problem of ours the earnest support of the whole profession everywhere. We have not had much of your support or interest in this matter in times past. We have not had your presence at any meeting of our sections or at our association. We cannot get anything from you but complaints. We have tried earnestly and faithfully to get you to attend the meetings of the hospital association, but you do not do it. You only stay at home and quarrel with what is being done. It occurred to us that if we invited you to attend the hospital section of the American Medical Association, we could talk over our troubles and correct them but you do not attend this section as you ought to do. You stay away. The hospital section at Minneapolis this year I will venture to say that not nine members in actual practice attended our section, and yet you are asking us for a tremendous lot of work and more and more every year. We know you need it. We want to give it to you, but we must have some sort of order.

In the past years in lowering the mortality rate, bettering all our final results, as has been pointed out by Dr. McMurty to-night but we are not satisfied and should not be for there is still a great deal of room for improvement, not only in reducing the mortality and improving our results, but in making the ordeal of operation and the time in hospitals a less trying one. If we are to do this we must make still further progress we must study more carefully our hospital efficiency not only in the operating room, but in every other department of the hospital. If we will remember efficiency in any line of business, as has been brought to our attention so much of late if we compare hospital efficiency with the high standards attained in business, we will not be satisfied.

There are many things in hospitals that one might speak of but I wish to speak of one thing particularly and that is, service in our hospitals is in line with what Dr. Dickinson has had to say with regard to standardization. We have been prodigal of the time and efforts of those who are working in our hospitals, more particularly our nurses, and little thought has been given to the cutting down—to simplifying the work of our nurses. The giving of a few enemata a few douches, always running back and forth from the drug room the sleeping room, etc., really consumes a forenoon for the average nurse, and a little thought directed to this would simplify the matter. I mention this to show that there is a tremendous waste of time and energy. If we could give it the thought required we would not only improve our hospital work, but our patients would be better off. It would give our nurses more time for study and recreation, and we would be able to lead a far more rational life. So much for the nurse's work in the hospital.

When we come to the operating room we find the same waste of time on the part of the nurses and assistants. One man recently in one of the largest clinics in this country watched the work of the utility nurse for a forenoon,—the nurse who does the work about the room,—and he counted the steps she took during the forenoon in going back and forth. Besides the manual labor she accomplished, she walked four miles. It does not seem as though that is necessary and surely it cannot be. It should be and will be cut down.

When we come to study the work done by the assistants—how many assistants are really necessary to do efficient work, to do thoroughly rapid work, and thoroughly good work? If we are to arrive at a conclusion, we must study the work

that has been done in various clinics. Dr. Dickinson has pointed out the necessity of introducing these things in clinics. Jones, in Liverpool, England, operated upon twenty orthopedic cases in a forenoon, with but two assistants. Everything was simple. Everything went off rapidly and the work was beautifully done. On the other hand, in one of the most brilliant clinics here we saw a large number of assistants, with a great deal of confusion, so that literally they were falling over each other. These things must be and can be standardized. We must get down to something more simple. One thing that is necessary to bear in mind is the fact that work in a hospital is largely done by the women, and necessarily this must be so. Every surgeon knows what is needed to take hold of these problems and to improve them, and I only call attention to these things because I feel very strongly the necessity of studying this subject both in the operating room and as a practitioner.

Dr. JOHN A. HODGINS was asked to take part in the discussion. He said: We hospital administrators think of two or three things in connection with hospital progress to-day. First, while it is not a part of our business to tell you how to do your work, we have our own opinion about it, and one of the things we think is not quite as modern as it might be is the getting of patients back to bed in good enough shape. We administrators think you ask us to take care of your desperate cases when they get back to bed. That means one of the things you have taken too long to do the operation, or that we have not done our part in the operative technique that has permitted you to do your work fast enough. We are not going to inquire at this stage of the game which it is.

Another thing we find is this, that surgery varies. Some surgery is done with two and one-half per cent carbolic acid spray and from this we come all the way down to the fancy needle work of Dr. Dickinson. We find this to be true. You have grown in your surgical operative technique from one nurse and possibly one interne (the interne being luxury) clear down to the point now where the gynecologist is commanding three nurses and three internes, and some sort of an anesthetist. There are six people and the operator. We find from our standpoint that we are in each other's way—I mean the internes and the nurses,—and yet you are calling for more, more, all the time. That is due to one or two things—and we are going on the assumption it is our fault, the administrative side of the work. Probably you have been going so fast and doing

is not even a hint at the all important principle that an antiseptic sufficiently potent to destroy vegetable (bacterial) cells is equally powerful in destroying cells of the human body; furthermore, the principle of osmosis as a factor governing the penetration and hence the effectiveness of germicides is not mentioned. If we may credit very excellent experimental work done abroad and careful work done in America, 95 per cent alcohol is far better antiseptic than 70 per cent or 50 per cent alcohol, because the stronger the percentage, the more active is the osmotic power and yet Bryan restates the old dogma of 50 per cent efficiency.

Under the head of inflammation we may very properly consider from the practical as well as the philosophical point of view that the most important principle lies in the fact that inflammation is a constructive and conservative rather than a destructive force. Bryan elides this fact. The important principle underlying shock is that all the vital body functions are compromised. This is a broad generalization that finds no emphasis in Bryan's hand. A most important practical principle in hemorrhage is the fact that the white blood count goes up even before the red blood count goes down. Bryan does not state this, even by way of differentiating shock from hemorrhage. Verworn, Meyer and Overton have supplied us with an excellent basis in explanation of the action of anesthetics, but none of their conclusions are incorporated as principles by our author.

No good would come from pointing out in greater detail the author's failure to emphasize fundamental principles. Indeed, our purpose is not to practice sharp critique, but rather to drive home the fact pointed out by de Nancrede fifteen years ago in his *Lectures upon the Principles of Surgery* that many of the excellent works on the principles of surgery are marred, as regards their usefulness by the attempt to render them too comprehensive. Bryan's volume mirrors industry, care, and thoughtful design. It misses out rather by overreaching than by failure to hit the mark. The book is admittedly intended chiefly for students and it purposes to teach students surgical principles and yet it not only fails to define what surgical principle is, but also repeatedly confuses the student by encompassing the various principles in masses of data properly belonging to works dealing with the fundamental (laboratory) branches of medical science.

EVERY now and then there appears a book that stirs the selfish heart of the reader to wish himself the sole possessor of the volume, a sensation closely akin to the spirit of the antiquarian who loves his book in a measure proportioned to its scarcity value. One experiences such a sensation reading the new operative surgery by Krause and Heyman, which has just appeared. The bold, large,

wide margined pages, with their beautifully clear type and marvelously executed illustrations make a lasting appeal on first inspection.

The plan of the work is pretentious. There are to be six volumes in all, of which only the first two have appeared, dealing with the general principles of operative technique and the surgery of the head. The fundamental purpose back of the work is to detail operative procedure both from the purely technical as well as from the clinical point of view. In this we note a similarity to the excellent English work on operative surgery by Jacobson, and a variation from almost all other similar treatises. And just here we may say that these first two volumes furnish excellent testimony that Krause is going to turn out a finished product in every sense of the word.

Volume I takes up in great detail the subjects of preparation for operation, anesthesia, asepsis, bandaging and after-treatment, the treatment of head injuries, operations for tumors of the face, plastic operations on the face, surgery of the eye, ear, nose and sinuses, and finally the surgery of trifacial neuralgia. If we say that each of these various subjects is handled in a fashion that mirrors mastery, we shall spare ourselves the impossible task of specific criticism in necessarily limited space. It is a pity that Krause omitted intratracheal intubation, under the head of anesthesia, and it is difficult to explain the omission, for only recently in current literature, he commented on the excellence of the procedure, in head surgery. The chapter on trigeminal neuralgia is a particularly interesting one, in that it furnishes a complete description of all types of operations on the gasserian ganglion and all its branches, and also in that Krause states unequivocally that many cases of trigeminal neuralgia are permanently cured by alcohol injections.

The second volume, consisting of three hundred and fifty pages, takes up the surgery of the superior and inferior maxilla, and the mouth, resection of the temporo-mandibular articulation, surgery of the pharynx, salivary glands, facial, occipital and cervical nerves, and finally the surgery of the brain. This final part devoted to the brain, follows very closely the lines developed by Krause in his two volume work on the brain and spinal cord, and is an essential to every one who aspires to know and do neurological surgery.

The most exacting critic who set about deliberately to discover flaws in either of the two volumes would find himself confronting a problem. In the second volume no mention is made of the admirable method of approach to the temporo-mandibular articulation devised by Lilienthal, but even this omission may be overlooked on the basis that Krause is presenting data from the point of view of his own personal experience.

Finally, critics of these two volumes must call special attention to the illustrations. Even we, in this country who have grown more or less accus-

LESENDE: DR. CHRISTOPHER OPERATIONS: DR. HANS
KRAUSE: RECHNUNGEN: VON: Prof. Dr. Julius Krause in
Gesellschaft mit Dr. Emil Heyman. Berlin und Wien: Urban und
Schwarsburg, 1911. Parts I and II.

BOOK REVIEWS

A CRITIQUE OF NEW BOOKS IN SURGERY

By N. G. SEELIG M D

AS rule, and for self evident reasons, third or later editions of any medical volume claim scant attention from the reviewer. An exception must be made of the fourth edition of Cripps' work, in order to note certain standard types of excellencies which cannot be emphasized too often. The volume itself and its general make-up are so well and deservedly known as a classic that detailed comment is superfluous. There are nineteen chapters in all, the last four devoted to cancer of the rectum, and the first fifteen to anatomy, methods of examination, malformations, hemorrhoids, prolapse, abscess, fistula, ulcer, fissure, stricture, pruritus, impaction, polypus, villous tumors, and sacral tumors.

The tone of the book, one is almost tempted to say the very feel of the book, lends assurance that here is a special subject treated by a man that commands the fields of general surgery and pathology. The volume is what it is, because it furnishes adequate information based both on fundamental principles and extensive personal experience, and clothed in pure and simple English, a recipe that will inevitably produce a good book. But Cripps has added two other ingredients: he has selectively described views and methods other than his own, thus making a good book a full book, and he has skillfully furnished just enough of the leaven of human interest and humor to make the full book a readable book. His illustration of the inconvenience caused by prolapsed hemorrhoids in the case of the barrister who was so frequently the subject of this accident when he rose to address a jury his warning against using barish paper to cleanse the anus after stool, with the added caution that the printer's ink used on radical newspapers is particularly irritating, and his vivid description of an impacted jam pot in the rectum make the book one to be read rather than merely to be consulted.

The chapters on Cancer of the Rectum are admirable in so far as the clinical descriptive side is concerned, but totally inadequate from the point of view of modern operative technique: the trans-sacral and the abdominal route operations are dismissed with a few words and the description of his own operation smacks of surgical days long past.

PROFESSOR BRYAN has written a handy, presentable, fairly well illustrated volume of some six hundred odd pages, on the Principles of Surgery. It has, with almost meticulous care, adhered to the formal manner of treating the subject, under the various heads: Asepsis, Wound Healing, Inflammation, Gangrene, Ulcer, Stoma, Fistula, Burns, Tumors, etc., etc. The sum total of the effort is a fairly readable and accurate presentation of a well classified mass of surgical data. As far as the essential facts are concerned, some of them are open to question. In many instances, however, additional facts might have been furnished by way of confirming old, or establishing new principles. For example, under gangrene, mention might have been made of the recent excellent studies of thrombo-angitis obliterans; the work of Meltzer on magnesium sulphate as a motor depressant should have been incorporated under the head of tetanus; in the chapter on rabies, a few words should have been added to make clear the distinction between street virus and fixed virus; the principles underlying shock should have been stated more fully in discussing burns, some mention should have been made of the vast amount of investigative work done on the effects of the absorption of altered proteids; and under the head of anaesthesia mention at least should have been made of the intratracheal method.

All this, however, constitutes suggestion rather than criticism. The constructive critic must see, and therefore must needs point out, the all-important fact that Professor Bryan has entitled his volume.

Principles and yet has so far failed either to state specific principles, or to emphasize their importance, as to rob the volume of the character connoted by the title. For example, if we contrast the chapter by Bryan on bacteria with the recent Harvey lecture by Vaughan, we note that Bryan in forty-five closely packed pages fails to state what Vaughan says, in a paragraph, regarding the essential principles governing bacterial action and tissue reaction. Why confuse the student with the false notion that an accurate classification of bacteria constitutes the enumeration of surgical principles? Under the head of aseptics and antisepsis there

ON DISEASES OF THE RECTUM AND ANUS, INCLUDING THE RECTO-ENTEROLOGY OF THE LACUNAECAL RECTUM BY C. CRIPPS. By HARRISON CRIPPS, M. C. B. Fourth Edition, New York, The Macmillan Company 1924.

PRINCIPLES OF SURGERY. By W. A. Bryan, A. M., M. D. Philadelphia & London: W. B. Saunders Company 1923. J. Am. M. Ass., 1924, 26: 71.

Clinical Congress of Surgeons of North America

FIFTH ANNUAL SESSION

LONDON ENGLAND

WEEK OF JULY 27 1914

THE LONDON COMMITTEE

Honorary Chairman SIR RICKMAN J GODLEY

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West London—MR. TYRRELL GRAY.
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St. Peter's—MR. J. THOMSON WALKER.
Princes of Wales—MR. H. W. CARSON.
Hampstead—MR. J. JACKSON CLARKE.
St. Marks—MR. P. LOCKHART HUMPHRY.
New Hospital for Women—MISS ALDRICH
BLAKE.
Royal Westminster—MR. W. H. McMULLIN.

toned to the high standard of surgical illustrating set by Broedel with his beautiful rose-board and wash work, must marvel at the accomplishments of Krause's anonymous artist. The plain black and white, as well as the colored plates, are artistic gems; but what is more important, they tell the story of the steps and details of the various operations so clearly that the text often becomes a matter of secondary consideration.

A good book, as well done as this, is an inspiration.

THE wish selfishly expressed above to own the volumes of Krause to the exclusion of all other readers might have been attended with a lurking sense of faint shame were it not for the fact that there was to follow the expression of the hope that an equally attractive book, by Kanavel, might be placed in the hands and under the eyes of every medical practitioner. If one were asked to name the classical medical treatises on the hand, he would be safe in venturing as an answer the monograph in Volkmann's *Vorträge* by Gerhard—*Die Hand des Kranken*—and this volume by Kanavel.

Kanavel himself notes the inexplicable fact that although the importance of the subject of acute infections of the hand has been recognized since earliest times, the student cannot find clear descriptions of the various types of disease with methods of diagnosis and treatment, in either textbooks or special articles. This want is now adequately filled. In his work, of which this is the second edition, Kanavel describes under two heads the simpler hand infections, and the grave infections, under which latter head he takes up tenosynovitis, fascial space abscess, lymphangitis, and allied conditions. His method of developing his thesis is admirable: a general discussion of the important points in diagnosis, followed by the general principles underlying treatment, then four chapters on the anatomy of the hand and forearm as it bears on the surgical treatment of these regions, and finally seventeen chapters devoted to detailed consideration of the pathology, symptomatology, diagnosis, differential diagnosis, and surgical treatment of the various grave types of infection.

Any man who has enjoyed the privilege of extensive out-patient work, and who has practiced carefully the arts of observation and inductive reasoning, will have confirmed, independently, many of the practical conclusions reached by Kanavel. Those who have not enjoyed such privilege will find that in treating acute diseases of the hand this book will serve as *modus vivendi* to be trusted under all conditions as safe, sane, and invaluable guide.

INSTRUCTIONS OF THE HAND. A Guide to Surgical Treatment of Acute and Chronic Inflammatory Processes in the Upper Hand and Forearm. By Allen H. Kanavel, M.D. Second Edition. Lea & Febiger, Philadelphia and New York, 1921.

THE excellent reasons why every physician should know medical history are so numerous that they might well be codified and yet it could seem that the doctors as a class are waiting for some gentle Elie to savor the subject and serve it in the form of *Tales of Old Physics*. However this may all be, we feel that there is a distinct place in specialized journal of surgery among reviews of surgical books, for not on purely historical work and if justification is necessary a plea of pardonable degree of Chauvinism, in that Garrison's *History of Medicine* is the product of an American. Furthermore it is not only the most adequate history of medicine ever turned out in our country but also compares most favorably with any other one volume work produced anywhere not even excepting Julius Pagel's *Geschichte der Medizin*.

As regards simplicity and beauty of style and diction, adequacy of illustrations, and attractive and orderly development of sequence nothing is left to be desired. Adhering to the now established formula of treating the history of medicine in *stages*, Garrison discusses, in twelve chapters, the subjects of Primitive Medicine, Egyptian Medicine, Sumeria and Oriental Medicine, Greek Medicine, The Byzantine Period, The Mohammedan and Jewish Periods, The Medieval Period, The Renaissance, and the Seventeenth, Eighteenth, Nineteenth, and Twentieth Centuries, in order. By the discriminating use of heavy faced type and small print Garrison furnishes balance to his pages, and, as it were, foothold to his reader. Furthermore, his admirable interpolations regarding the cultural aspects of the various periods lends certain charm of personal warmth that is most attractive. For instance, under the head of the cultural aspects of medicine during the 700 period, he brings us in close contact with many notables, among them, Hunter, Haller, Heberden, and Garth; their doings, their clothes, their sayings, he pictures eighteenth century quackery in fashion that should, through sense of historical perspective, assuage us in our wallings concerning present day charlatany and bring us peace and then finally he outlines the status of surgery in the various continental countries, the growth of hospitals abroad and of hospitals and medical schools in America during this era.

The introduction is ostensibly preface of purpose, but as matter of fact it is charmingly discursive essay on the history of medicine, in which, among other things, gentle quietus is put upon the doctrine of the enthusiast who advocates lumbering up the already burdened curriculum of the medical school with an obligatory course on the history of medicine.

AN EPOCHMAKER IN THE HISTORY OF MEDICINE WITH MEDICAL CHRONOLOGY, BIOGRAPHICAL DATA, AND SELF CRITICISM. By Jonathan H. Garrison, A.M., M.D. Illustrated. Philadelphia and London: W. B. Saunders Co. 1911.

CLINICAL CONGRESS OF SURGEONS OF NORTH AMERICA

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THE CLINICAL CONGRESS IN LONDON

THE London meeting of the Clinical Congress of Surgeons bids fair to mark an epoch in clinical teaching. The various hospitals have been well organized and are already collecting material to illustrate the different phases of surgical work. The large number of surgeons of international reputation connected with the many hospitals there has made it possible for the committee to divide the attendance so that every man will have an opportunity of filling each day with most valuable clinics. Moreover tickets have been provided which will be given out for each day's session in advance so that one may arrange to go from hospital to hospital, and from clinic to clinic, in a most satisfactory rotation, without loss of time, and with no fear that he will be unable to enter the clinics.

As is well known, this clinical idea is an unique one in London, and hence has been most enthusiastically supported by the entire surgical profession in that city.

The proximity of London to the Continent has enabled the committee to arrange a most memorable group of programs for the evening meetings. European surgeons known to the profession through the entire world, both English and Continental, have accepted invitations to address the Congress at the evening sessions. It would have been impossible to secure such a brilliant array of Europeans for any single series of meet-

ings in this country. A glance at the programs on the following pages will show how fortunate the committee has been in the selection of speakers and in the acceptances they have received to their invitations.

A few letters have reached headquarters in which it is stated that the writer had been unable to secure reservations on certain steamships, and asking our assistance in securing such reservations. This fact emphasizes the importance of a suggestion previously made that every one contemplating the trip to London should book passage at once. At that season of the year the ocean traffic is naturally heaviest and the additional travel to the Congress will increase the number.

It will be seen by reference to the notice of our Transportation Department that we have been able to arrange a very satisfactory reduction in rates for both the outward and homeward trips. A further concession is being sought, as the number of those who desire to go is beginning to be appreciated by the transportation companies. Any further concessions that can be secured before the date of sailing will be accorded to all those who make reservations through the Transportation Department, at any time previous to that date.

Hotel accommodations in London had best be

DIVISION OF SURGICAL SPECIALTIES

Tuesday July 28th in the Ballroom of the Hotel Savoy

- PROFESSOR E. SCHWENKELOW Copenhagen, Denmark The Results of Operations (Laryngofissure) for Cancer of the Larynx.
 Discussion by SIR ST. CLAIR THOMSON London.
 DR. J. M. WEST Berlin, Germany The Intranasal Surgery of the Lachrymal Apparatus after an Experience with over 5 Operations.
 Discussion by DR. D. R. PATTERSON of Cardiff.

Wednesday July 29th in the Ballroom of the Hotel Savoy

- DR. A. LOGAN TURNER Edinburgh The Application of Skiagraphy to the Mastoid Region and Its Use in the Detection of Disease.
 Discussion by MR. SIDNEY SCOTT London.
 MR. H. ORR E. JONES, Liverpool, England Some Considerations which Determine the Extent of an Operation in Septic Infection of the Lateral Sinus.
 Discussion by MR. HUNTER TEE London.

Friday July 31st in the Ballroom of the Hotel Savoy

- R. H. ELLIOTT, LL. CO. I. M. S. Madras, India The Sclero-Corneal Trephining Operation for Glaucoma.
 Discussion by MR. T. RACHEN COLLIER.
 MR. F. RICHARDSON CROSS, Bristol Operative Procedure for Strabismus.
 Discussion by MR. N. HINCHERLY London.
 DR. FRANK E. MURPHY, Bournemouth Cataract Extraction
 Discussion by DR. HOLMES SPENCER London.

PRELIMINARY CLINICAL PROGRAM

SURGICAL CLINICS

Monday July 27th

- MR. DARCY POWER — St Bartholomew Hospital — 10
 MR. H. J. WARRING — St Bartholomew Hospital — 10
 MR. C. GORDON WATSON — Bartholomew Hospital — 10
 MR. HAROLD W. WILSON — St Bartholomew Hospital — 10
 MR. H. B. ROBINSON — St Thomas Hospital — 1
 MR. CUTHBERT WALLACE — Thomas Hospital — 1
 MR. J. J. ALANIS — St Thomas Hospital — 1
 MR. J. ROCK CARLSON — Westminster Hospital — 9
 MR. ARTHUR NOT LANE — Guy Hospital — 1
 MR. L. ALLEN — Guy Hospital — 1
 MR. J. STEWART — Guy Hospital — 1
 MR. C. H. FAGG — Guy Hospital — 1
 MR. K. P. ROWLANDS — Guy Hospital — 1
 MR. P. TURNER — Guy Hospital — 1
 MR. J. C. HUGHES — Guy Hospital — 1
 MR. R. DAVIES-CHILLI — Guy Hospital — 9
 MR. H. S. FENDELBURG — St George Hospital — 1 to 4

- MR. T. CRISP ENGLISH — St George Hospital — 10 to 4
 MR. FREDERIC FIVE — London Hospital — 1
 MR. HUGH LETT — London Hospital — 9
 MR. A. FARCE GOULD and MR. W. S. HANDLEY — Middlesex Hospital — 10 to 1
 MR. A. E. BARKER — University College Hospital — 9
 MR. BILTON POLLARD — University College Hospital — 1
 MR. V. Z. COPI — St. Mary Hospital — 1
 MR. WATSON CHRYST — King's College Hospital — 1
 MR. A. CARLSON — King's College Hospital — 9
 MR. T. P. LIGG — King's College Hospital — 9
 MR. A. H. MUNDY — King's College Hospital — 1
 MR. H. F. WATERHOUSE — Charing Cross Hospital — 1
 MR. JAMES BERRY — Royal Free Hospital — 1 to 5
 MR. W. A. H. JONES — Metropolitan Hospital — 1
 MR. J. CUNNINGHAM and MR. CECIL ROYSTON — St. Peter's Hospital — 1
 MR. J. M. CURRIE — Hospital for Sick Children — 1
 MR. TAYRELL GRAY — Hospital for Sick Children — 1 to 5
 MR. D. ARMOUR — West London Hospital — 1

reserved in advance otherwise some difficulty may be found in securing the most desirable quarters.

From present indications it is evident that the

meeting will be a splendid success. The Transportation Department reports that reservations have been made by surgeons from all parts of the United States and Canada.

PROGRAM OF EVENING SESSIONS

GENERAL SURGICAL DIVISION

Presidential Meeting Monday July 27th in the Grand Hall Hotel Cecil

Formal Opening.

Address of Welcome by Sir RICHARD J. GOODE, Honorary Chairman of the London Committee.

Welcome to American Surgeons, by the HONORABLE WALTER HUNTER PAGE, American Ambassador.

GEORGE EMMERTON BREWER, M.D. New York City: Address of retiring president.

Inauguration of President JOSEPH B. MURPHY and Vice President GEORGE E. ARMITAGE.

PROFESSOR A. von ESMARCK, Vienna: Treatment of Ulcer of the Stomach.

Discussion by Sir W. THOMAS COOPER and Mr. JAMES SERRIN.

JOSEPH B. MURPHY, M.D. Chicago, Presidential Address: Arthrodesis and Bone Transplantation; Its Limitations and Technique.

Tuesday July 28th in the Grand Hall Hotel Cecil

E. WYLLIE ANDERSON, M.D. Chicago: Cure of Hernia by Tissue Inlaying or Fascial Implantation.

Discussion by Mr. LAURENCE HUGHES MCGEE, F.R.C.S.

Mr. ROBERT JONES, F.R.C.S. Liverpool

Discussion by London Surgeons

Wednesday July 29th in the Grand Hall Hotel Cecil

GEORGE E. ARMITAGE, M.D. Montreal: Typhoid Perforation.

Discussion by Sir ARTHUR BOWLEY, F.R.C.S. London.

PROFESSOR TUFFIER, Paris: Transplantation of Ovaries.

Discussion by London Surgeons.

CHARLES H. MAYO, M.D. Rochester: Primary and Late Results of Operations for Exophthalmic Goiter or Hyperthyroidism.

Discussion by Mr. JAMES BERRY, F.R.C.S.

Thursday July 30th in the Grand Hall Hotel Cecil

PROFESSOR DOCTOR KROTH, Freiburg, Germany: The Principles of Non-Operative Treatment of Carcinoma.

JAMES F. PERRY, M.D. Galzburg, Illinois: The Treatment of Inoperable Carcinoma of the Uterus by the Application of Heat.

Mr. THOMAS WILSON, F.R.C.S. Birmingham: Radical Operative Treatment of Cancer of the Uterus.

Discussion by Dr. THOMAS WILSON, F.R.C.S., Mr. W. C. MILLER, F.R.C.S., London and Dr. JOSEPH COLE BLOODGOOD, Baltimore.

Friday July 31st in the Grand Hall Hotel Cecil

Mr. HENRY JELLIETT, F.R.C.P. Dublin: The Use of the Levator Ani Muscle and the Utero-Sacral Ligament in Pro-lapse Treatment.

Discussion by Dr. Herbert Spencer, London.

JOSEPH COLE BLOODGOOD, M.D. Baltimore: Surgery of Intestinal Stoma.

Mr. WILLIAM ORRILL, Oxford: Intestinal Stoma.

Discussion by Sir ARTHUR BOWLEY.

DIVISION OF SURGICAL SPECIALTIES

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Discussion by MR. TREACHER COLLINGS.

MR. F. RICHARDSON Cross, Bristol Operative Procedure for Strabismus.

Discussion by MR. N. BERRY HARMAN, London.

DR. ERNEST E. MADDOCK, Bournemouth Cataract Extraction.

Discussion by DR. HOLMES SPICER London.

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SURGICAL CLINICS

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MIR. IL J. WARING—St. Bartholomew's Hospital—10.

MIR. C. GORDON WATSON—St. Bartholomew's Hospital—10.

MIR. HAROLD W. WILSON—St. Bartholomew's Hospital—10.

MIR. H. B. ROBINSON—St. Thomas Hospital—10.

MIR. CUTHBERT WALLACE—St. Thomas Hospital—10.

MIR. J. E. ADAMS—St. Thomas' Hospital—9 to 10.

MIR. E. ROCK CARLING—Westminster Hospital—9.

MIR. ARTHUR NOT LANE—Guy Hospital—10.

MIR. L. A. DUNN—Guy Hospital—10.

MIR. F. J. STEWARD—Guy Hospital—10.

MIR. C. H. FAGG—Guy Hospital—10.

MIR. R. P. ROWLANDS—Guy Hospital—10.

MIR. P. TURNER—Guy Hospital—10.

MIR. D. C. HUGHES—Guy Hospital—10.

MIR. R. DAVIES-COLLEY—Guy Hospital—10.

MIR. H. S. PENDLEBURY—St. George's Hospital—10 to 11.

MIR. T. CRISP ENGLISH—St. George's Hospital—10 to 11.

MIR. FREDERIC EVE—London Hospital—9.

MIR. HUGH LETT—London Hospital—9.

MIR. A. PEARCE GOULD and MR. W. S. HANDLEY—Middlesex Hospital—10.

MIR. A. E. BARKER—University College Hospital—9.

MIR. BILTON POLLARD—University College Hospital—10.

MIR. V. Z. COPE—St. Mary's Hospital—10.

MIR. WATSON CHIEVNE—Keele College Hospital—10.

MIR. A. CARLESS—Keele College Hospital—10.

MIR. T. F. LEGG—Keele College Hospital—10.

MIR. A. EDMUNDS—Keele's College Hospital—10.

MIR. H. F. WATERHOUSE—Charing Cross Hospital—10.

MIR. JAMES HERRY—Royal Free Hospital—10 to 11.

MIR. W. ASHDOWNE—Metropolitan Hospital—10.

MIR. J. CUNNING and MR. CECIL ROWNTREE—Cancer Hospital—10.

MIR. E. M. CORNER—Hospital for Sick Children—10 to 11.

MIR. TYRRELL GRAY—Hospital for Sick Children—10 to 11.

MIR. D. ARMOUR—West London Hospital—10.

MR. L. GILLESPIE—Prince of Wales General Hospital—190 to 470.
 MR. LOCKHART HUMPHREY—St. Mark Hospital—70.
 MISS CHADDURN—New Hospital for Women—2.

Tuesday July 28th

MR. W. McADAM ECCLES—St. Bartholomew's Hospital—70.
 MR. R. COLEMAN BAILEY—St. Bartholomew's Hospital—70.
 MR. G. H. MAKINS—St. Thomas' Hospital—to 5.
 MR. W. H. BATTLE—St. Thomas' Hospital—to 5.
 MR. C. A. BALLANCE—St. Thomas' Hospital—to 5.
 MR. H. B. ROBINSON—St. Thomas' Hospital—to 5.
 MR. CYRIL NITCH—St. Thomas' Hospital—to 5.
 MR. W. G. SPENCER—Westminster Hospital—2.
 SIR ARBUTHNOT LANE—Guy Hospital—2.
 MR. L. A. DUNN—Guy Hospital—2.
 MR. F. J. STEWARD—Guy Hospital—2.
 MR. C. H. FAGGIE—Guy Hospital—2.
 MR. R. F. ROWLANDS—Guy's Hospital—2.
 MR. P. TURNER—Guy's Hospital—2.
 MR. E. C. HUGHES—Guy Hospital—2.
 MR. G. R. TURNER—St. George's Hospital—30 to 4.
 MR. F. JAFFREY—St. George's Hospital—30 to 4.
 MR. H. M. RIGBY—London Hospital—2.
 MR. JAMES SHERRIN—London Hospital—0.
 MR. R. WARREN—London Hospital—2.
 MR. J. KIDD—London Hospital—2.
 MR. JOHN MURRAY and MR. ALFRED JOHNSON—Middlesex Hospital—70.
 MR. T. H. KELLOCK and MR. GORDON TAYLOR—Middlesex Hospital—70.
 MR. RAYMOND JOHNSON—University College Hospital—2.
 MR. WILFRED TROTTER—University College Hospital—2.
 MR. WARREN LOW—St. Mary's Hospital—10.
 MR. F. F. BURGHARD—King's College Hospital—2.
 MR. G. L. CHIFFATLE—King's College Hospital—070.
 MR. STANLEY BOYD—Charing Cross Hospital—to 5.
 MR. W. H. EVANS—Royal Free Hospital—to 5.
 MR. H. CURTIS—Metropolitan Hospital—2.
 MR. JOCELYN SWAN and MR. H. W. WILSON—Cancer Hospital—2.
 SIR ARBUTHNOT LANE—Hospital for Sick Children—0 to 5.
 MR. GEORGE WAUGH—Hospital for Sick Children—to 5.
 MR. A. BALDWIN—West London Hospital—2.
 MR. G. L. ADDISON—West London Hospital—0.
 MR. VICTOR HORSLEY—Nelson Hospital—10.
 Surgery of the head and nervous system.
 MR. H. W. CARSON—Prince of Wales General Hospital—190 to 470.
 MISS ALDRICH BLAKE—New Hospital for Women—2.

MR. G. H. MAKINS—St. Thomas' Hospital—to 5.
 MR. W. H. BATTLE—St. Thomas' Hospital—to 5.
 MR. C. A. BALLANCE—St. Thomas' Hospital—to 5.
 MR. H. B. ROBINSON—St. Thomas' Hospital—to 5.
 MR. F. M. CORNER—St. Thomas' Hospital—to 5.
 MR. PERCY SARGENT—St. Thomas' Hospital—to 5.
 MR. C. STONHAM—Westminster Hospital—2.
 MR. J. M. G. SWAINSON—Westminster Hospital—0.
 MR. IVOR BACK—St. George's Hospital—050.
 MR. C. H. FRANKAU—St. George's Hospital—050 to 11.
 MR. J. HUTCHINSON—London Hospital—2.
 MR. R. MILNE—London Hospital—2.
 MR. A. J. WALTON—London Hospital—0.
 SIR JOHN BLAND-BUTTON and MR. GORDON TAYLOR—Middlesex Hospital—70.
 MR. RAYMOND JOHNSON—University College Hospital—2.
 SIR WATSON CHEYNE—King's College Hospital—070.
 MR. A. CARLESS—King's College Hospital—2.
 MR. T. P. LEGG—King's College Hospital—2.
 MR. CHARLES GIBBS—Charing Cross Hospital—to 5.
 MR. JAMES BERRY—Royal Free Hospital—to 5.
 MR. J. CUNNING—Royal Free Hospital—to 5.
 MR. F. L. DANIEL—Metropolitan Hospital—10.
 MR. C. RYALL—Cancer Hospital—2.
 MR. T. H. KELLOCK—Hospital for Sick Children—070 to 11.
 MR. L. E. BARRINGTON-WARD—Hospital for Sick Children—to 5.
 MR. J. HOWELL EVANS—Prince of Wales General Hospital—070 to 70.
 MR. JACKSON CLARKE—Hampstead General Hospital—70.
 MR. GEORGE WAUGH—Hampstead General Hospital—to 10.
 MR. RUDNEY BOYD—Hampstead General Hospital—to 10.
 MR. CHAD WOODWARD—Hampstead General Hospital—to 0.
 MR. ASLETT BALDWIN—St. Mark's Hospital—70.
 MISS GARRETT ANDERSON and MISS BOLTON—New Hospital for Women—0.

Thursday July 30th

MR. D'ARCY POWER—St. Bartholomew's Hospital—70.
 MR. R. COLEMAN BAILEY—St. Bartholomew's Hospital—70.
 MR. L. BATHIE RAWLING—St. Bartholomew's Hospital—70.
 MR. G. E. GASK—St. Bartholomew's Hospital—170.
 MR. H. B. ROBINSON—St. Thomas' Hospital—to 5.
 MR. CUTHBERT WALLACE—St. Thomas' Hospital—to 5.
 MR. F. M. CORNER—St. Thomas' Hospital—to 5.
 MR. J. E. ADAMS—St. Thomas' Hospital—to 5.
 MR. W. TURNER—Westminster Hospital—0.
 SIR ARBUTHNOT LANE—Guy Hospital—2.
 MR. F. J. STEWARD—Guy's Hospital—2.
 MR. C. H. FAGGIE—Guy's Hospital—2.
 MR. P. TURNER—Guy's Hospital—2.
 MR. E. C. HUGHES—Guy's Hospital—2.
 SIR ANTHONY BOWLBY—St. Bartholomew's Hospital—70.
 MR. H. J. WARING—St. Bartholomew's Hospital—70.
 MR. W. GIRLING BALL—St. Bartholomew's Hospital—190.

Wednesday July 29th

MR. D'ARCY POWER—St. Bartholomew's Hospital—70.
 MR. R. COLEMAN BAILEY—St. Bartholomew's Hospital—70.
 MR. L. BATHIE RAWLING—St. Bartholomew's Hospital—70.
 MR. G. E. GASK—St. Bartholomew's Hospital—170.
 MR. H. B. ROBINSON—St. Thomas' Hospital—to 5.
 MR. CUTHBERT WALLACE—St. Thomas' Hospital—to 5.
 MR. F. M. CORNER—St. Thomas' Hospital—to 5.
 MR. J. E. ADAMS—St. Thomas' Hospital—to 5.
 MR. W. TURNER—Westminster Hospital—0.
 SIR ARBUTHNOT LANE—Guy Hospital—2.
 MR. F. J. STEWARD—Guy's Hospital—2.
 MR. C. H. FAGGIE—Guy's Hospital—2.
 MR. P. TURNER—Guy's Hospital—2.
 MR. E. C. HUGHES—Guy's Hospital—2.

MR. R. DAVIES-COLLEY—Guy's Hospital—2.
 MR. G. R. TURNER—St. George's Hospital—30
 to 4.
 MR. T. CRISP ENGLISH—St. George's Hospital—
 30 to 4.
 MR. W. FEDDE FEDDEN—St. George's Hospital—
 9 to 1.
 MR. IVOR BACK—St. George's Hospital—9 to 1.
 MR. C. H. FRANKAU—St. George's Hospital—9 to 1.
 to 11.
 MR. T. H. OFENSHAW—London Hospital—2.
 MR. RUSSELL HOWARD—London Hospital—9.
 MR. F. KIDD—London Hospital—2.
 MR. A. PEARCE GOULD and MR. W. S. HANDLEY
 —Middlesex Hospital—30.
 MR. A. E. BARKER—University College Hospital—2.
 MR. MORRISTON DAVIES—University College Hos-
 pital—9.
 MR. W. H. CLAYTON-GREEN—St. Mary's Hospital
 —10.
 MR. F. F. BURGHARD—King's College Hospital—2.
 MR. A. EDMUNDS—King's College Hospital—2.
 MR. H. F. WATERHOUSE—Charing Cross Hospital
 —to 5.
 MR. W. S. FENWICK—Charing Cross Hospital—9
 to 2.
 MR. C. PANNETT—Royal Free Hospital—to 5.
 MR. H. E. MILES—Cancer Hospital—
 MR. W. A. T. FAIRBANK—Hospital for Sick Chil-
 dren—5 to 6.
 MR. O. L. ADDISON—Hospital for Sick Children—9
 to 2.
 MR. H. W. CARSON—Prince of Wales General Hos-
 pital—9 to 30.
 MR. GORDON WATSON—St. Mark's Hospital—2 to 30.
 MISS CHADBURN—New Hospital for Women—2.

Friday July 31st

SIR ANTHONY BOWLEY—St. Bartholomew's Hos-
 pital—5 to 30.
 MR. W. McADAM ECCLES—St. Bartholomew's
 Hospital—30.
 MR. G. H. MAKINS—St. Thomas Hospital—to 5.
 MR. W. H. BATTLE—St. Thomas Hospital—to 5.
 MR. C. A. RALLANCE—St. Thomas' Hospital—
 to 5.
 MR. CYRIL NITCH—St. Thomas Hospital—to 5.
 MR. ARTHUR EVANS—Westminster Hospital—9.
 SIR ARBUTHNOT LANE—Guy's Hospital—
 MR. L. A. DUNN—Guy's Hospital—
 MR. F. J. STEWARD—Guy's Hospital—2.
 MR. C. H. FAGGE—Guy's Hospital—2.
 MR. R. P. ROWLANDS—Guy's Hospital—
 MR. P. TURNER—Guy's Hospital—2.
 MR. E. C. HUGHES—Guy's Hospital—2.
 MR. F. JAFFREY—St. George's Hospital—30 to 4.
 MR. H. K. PENDLEBURY—St. George's Hos-
 pital—30 to 4.
 SIR FREDERIC EVE—London Hospital—
 MR. H. M. RIGBY—London Hospital—9.
 MR. JAMES SHERREN—London Hospital—
 MR. J. HUGH LETT—London Hospital—2.
 MR. JOHN MURRAY and MR. ALFRED JOHNSON
 —Middlesex Hospital—30.
 MR. T. H. KELLOCK and MR. GORDON TAYLOR
 —Middlesex Hospital—30.

MR. BILTON POLLARD—University College Hos-
 pital—2.
 MR. WILFRED TROTTER—University College Hos-
 pital—9.
 MR. D. C. L. FITZWILLIAMS—St. Mary's Hos-
 pital—10.
 SIR WATSON CHEYNE—King's College Hospital—
 MR. A. CARLESS—King's College Hospital—9 to 30.
 MR. G. L. CHEATLE—King's College Hospital—2.
 MR. T. P. LEGGE—King's College Hospital—9 to 30.
 MR. A. EDMUNDS—King's College Hospital—2.
 MR. STANLEY BOYD—Charing Cross Hospital—
 to 5.
 MR. P. L. DANIELS—Charing Cross Hospital—9 to 10.
 MR. W. H. EVANS—Royal Free Hospital—2 to 5.
 MR. H. CURTIS—Metropolitan Hospital—2.
 SIR ARBUTHNOT LANE—Hospital for Sick Chil-
 dren—9 to 10.
 MR. O. L. ADDISON—Hospital for Sick Children—
 to 5.
 MR. H. S. SOUTTAR—West London Hospital—9.
 MR. J. HOWELL EVANS—Prince of Wales General
 Hospital—30 to 4 to 30.
 MR. J. W. THOMPSON WALKER—Hampstead Gen-
 eral Hospital—9.
 MR. GEORGE WAUGH—Hampstead General Hos-
 pital—9.
 MR. SIDNEY BOYD—Hampstead General Hos-
 pital—10.
 MR. CLAUD WOODWARD—Hampstead General Hos-
 pital—9.
 MISS ALDRICH BLAKE—New Hospital for Women
 —9.
 MR. DONALD ARMOUR—National Hospital—
 Surgery of the Head and Nervous system.
 MR. PERCY SARGENT—National Hospital—9.
 Surgery of the Head and Nervous System.

Saturday August 1st

MR. W. FEDDE FEDDEN—St. George's Hospital—
 30 to 4.
 MR. IVOR BACK—St. George's Hospital—30 to 4.
 SIR JOHN BLAND-SUTTON and MR. GORDON
 TAYLOR—Middlesex Hospital—1 to 30.
 MR. MORRISTON DAVIES—University College Hos-
 pital—9.
 MR. F. F. BURGHARD—King's College Hospital—
 9 to 30.
 MR. G. L. CHEATLE—King's College Hospital—
 MR. CHARLES GIBBS—Charing Cross Hospital—
 9 to 10.
 MR. H. S. CLOGG—Charing Cross Hospital—to 5.
 MR. C. A. JOLL—Royal Free Hospital—to 5.
 MR. P. L. DANIEL—Metropolitan Hospital—9.
 MR. H. A. T. FAIRBANK—Hospital for Sick Children
 —9 to 10.
 MR. H. TYRRELL GRAY—West London Hospital—
 9.
 MR. E. GILLESPIE—Prince of Wales General Hos-
 pital—9 to 30 to 1 to 30.

Days and Hours to be Announced

MR. MAYNARD SMITH—St. Mary's Hospital.

GYNECOLOGICAL CLINICS

Monday July 27th

- DR. W. S. A. GRIFFITH—St. Bartholomew Hospital—
 —
 DR. A. F. STABB and DR. G. F. DARWELL SMITH—
 St. George's Hospital—9.51
 DR. DRUMMOND MAXWELL—London Hospital—2.
 DR. JOHN PHILLIPS—King's College Hospital—
 DR. A. F. GILES—Chelsea Hospital for Women—9.30.
 DR. S. DODD—Chelsea Hospital for Women—9.30.

Tuesday July 28th

- DR. J. BARRIS—St. Bartholomew's Hospital—10.
 DR. WALTER TATE—St. Thomas Hospital—1.5.
 MR. H. CHAPPLE—Guy Hospital—2.
 DR. COMYNS BERKELEY and DR. VICTOR BON-
 NEY—Middlesex Hospital—10.
 DR. HERBERT SPENCER—University College Hos-
 pital—6.
 DR. HUGH PLAYFAIR—King's College Hospital—
 DR. T. W. EDEN and DR. C. H. LOCKYER—Charing
 Cross Hospital—10.5.
 MRS. A. MUGILL SAWYER—Royal Free Hospital—
 10.5.
 DR. W. H. FENTON—Chelsea Hospital for Women
 —10.
 DR. VICTOR BONNEY—Chelsea Hospital for Women
 —9.30.
 DR. J. B. BANISTER—Chelsea Hospital for Women
 —10.
 DR. DRUMMOND ROBINSON—West London Hos-
 pital—9.

Wednesday July 29th

- DR. W. S. A. GRIFFITH—St. Bartholomew Hos-
 pital—
 MR. G. R. SMITH—Guy Hospital—9.

Thursday July 30th

- DR. H. WILLIAMSON—St. Bartholomew Hospital
 —10.
 DR. WALTER TATE—St. Thomas Hospital—9 to
 2.

- MIR. H. CHAPPLE—Guy Hospital—9
 DR. DRUMMOND MAXWELL—London Hospital
 —10.
 DR. COMYNS BERKELEY and DR. VICTOR BON-
 NEY—Middlesex Hospital—10.
 DR. GEORGE BLACKER—University College Hos-
 pital—2.
 DR. JOHN PHILLIPS—King's College Hospital—
 DR. H. G. PLAYFAIR and DR. EARDLEY BOLLAND
 —Metropolitan Hospital—2.
 DR. T. W. EDEN—Chelsea Hospital for Women—9.30
 DR. F. L. PRORIS—Chelsea Hospital for Women—
 9.30.
 DR. ARTHUR GILES and DR. J. B. BANISTER—
 Prince of Wales General Hospital—1.30 to 4.30.

Friday Jul 31st

- DR. W. S. A. GRIFFITH—St. Bartholomew's Hos-
 pital—
 DR. G. H. D. ROBINSON and DR. S. DODD—West
 London Hospital—2.
 MR. G. R. SMITH—Guy Hospital—
 DR. A. F. STABB and DR. G. F. DARWELL SMITH—
 St. George's Hospital—9.51 to
 DR. HUGH PLAYFAIR—King's College Hospital—
 DR. T. W. EDEN and DR. C. H. LOCKYER—Char-
 ing Cross Hospital—10.5.
 MRS. WILLY—Royal Free Hospital—10
 DR. COMYNS BERKELEY—Chelsea Hospital for
 Women—10.
 DR. H. J. SIMMONS—West London Hospital—
 DR. ARTHUR GILES and DR. J. B. BANISTER—
 Prince of Wales General Hospital—9.30 to 1.30.

Saturday 1 August 1911

- DR. HERBERT SPENCER—University College Hos-
 pital—6.

Days and Hours to be remembered

- MR. JOHN FAIRBAIRN and DR. J. P. HEDLEY—
 St. Thomas Hospital
 DR. W. J. GOW—St. Mary Hospital

GENITO-URINARY SURGICAL CLINICS

Monday July 27th

- MR. A. R. THOMSON—Guy Hospital—9.

Wednesday July 29th

- MR. J. S. PARDOE—West London Hospital—
 MR. P. J. FREYER—St. Peter's Hospital—

- MR. J. W. THOMSON WALKER—St. Peter's Hos-
 pital—

Friday Jul 31st

- MR. F. SWINFORD EDWARDS—St. Peter's Hos-
 pital—
 MR. G. S. PARROE—St. Peter Hospital—
 MR. J. SWIFT JONES—St. Peter Hospital—2.

ORTHOPEDIC CLINICS

Monday July 27th

MR. R. C. ELMISLIE — St. Bartholomew Hospital —
 3.30.
 MR. A. H. TUBBY — Westminster Hospital — 2.

Tuesday July 28th

MR. R. C. ELMISLIE — St. Bartholomew Hospital —
 3.30.

MR. W. H. TRETHOWAN — Guy Hospital — 2.

Thursday July 30th

MR. H. A. T. FAIRBANK — Charing Cross Hospital —
 9 to 2.

Friday July 31st

MR. W. H. TRETHOWAN — Guy's Hospital —

OPHTHALMOLOGICAL CLINICS

Monday July 27th

MR. H. L. FASON — Guy Hospital — 2.
 MR. L. V. CARGILL — King College Hospital —
 MR. H. W. LYLE — King College Hospital
 MR. A. E. DORRILL — Prince of Wales General Hos-
 pital — 10 to 3.30.
 MR. TREACHER COLLINS — Royal London Ophthalmic
 Hospital — 6.
 MR. C. A. WORTH — Royal London Ophthalmic Hos-
 pital — 6.
 MR. M. L. HEPBURN — Royal London Ophthalmic
 Hospital —
 MR. A. C. HUDSON — Royal London Ophthalmic Hos-
 pital —

Tuesday July 28th

MR. W. H. JESSOP — St. Bartholomew Hospital — 3
 MR. G. HARTBRIDGE and MR. G. T. B. JAMES —
 Westminster Hospital — 9.
 MR. A. W. ORMOND — Guy Hospital — 2.
 MR. M. L. HEPBURN — Royal Free Hospital — 9 to
 2.
 MR. E. T. COLLINS — Charing Cross Hospital — 9
 to
 MR. HOLMES SPICER — Royal London Ophthalmic
 Hospital —
 MR. PERCY FLEMING — Royal London Ophthalmic
 Hospital — 6.
 MR. J. H. FISHER — Royal London Ophthalmic Hos-
 pital — 6.
 MR. C. D. MARSHALL — Royal London Ophthalmic
 Hospital —

Wednesday July 29th

MR. H. BARR GRIMSDALE and MR. G. T. BROOKS-
 BANK JAMES — St. George Hospital — 30 to 4.
 MR. A. T. LISTER — London Hospital — 3.
 MR. PERCY FLEMING — University College Hos-
 pital — 9.
 MR. E. T. COLLINS — Charing Cross Hospital — 9
 to
 MR. R. P. BROOKS — Prince of Wales General Hos-
 pital — 30 4.30.

MR. J. B. LAWFORD — Royal London Ophthalmic
 Hospital — 6.
 MR. ARNOLD LAWSON — Royal London Ophthalmic
 Hospital — 6.
 MR. J. H. PARSONS — Royal London Ophthalmic Hos-
 pital —
 MR. GEORGE COATS — Royal London Ophthalmic
 Hospital — 6.

Thursday July 30th

MR. W. HOLMES SPICER — St. Bartholomew Hos-
 pital — 2.
 MR. H. L. FASON — Guy Hospital —
 MR. A. B. ROXBURGH — London Hospital — 6.
 MR. L. V. CARGILL — King College Hospital — 2.
 MR. H. W. LYLE — King College Hospital.
 MR. H. PERCY DUNN — West London Hospital —
 MR. TREACHER COLLINS — Royal London Ophthalmic
 Hospital —
 MR. C. A. WORTH — Royal London Ophthalmic Hos-
 pital —
 MR. M. L. HEPBURN — Royal London Ophthalmic
 Hospital — 6.
 MR. A. C. HUDSON — Royal London Ophthalmic Hos-
 pital — 6.

Friday July 31st

MR. A. W. ORMOND — Guy Hospital — 2.
 MR. HOLMES SPICER — Royal London Ophthalmic
 Hospital — 6.
 MR. PERCY FLEMING — Royal London Ophthalmic
 Hospital —
 MR. J. H. FISHER — Royal London Ophthalmic Hos-
 pital — 6.
 MR. C. D. MARSHALL — Royal London Ophthalmic
 Hospital — 6.

Saturday August 1st

MR. H. BARR GRIMSDALE and MR. G. T. BROOKS-
 BANK JAMES — St. George Hospital — 9.15 to

GYNECOLOGICAL CLINICS

Monday July 27th

DR. W. S. A. GRIFFITH—St. Bartholomew's Hospital—*a*.
 DR. A. I. STABB and DR. G. F. DARWELL SMITH—St. George's Hospital—*0.15 to 1*.
 DR. DRUMMOND MAXWELL—London Hospital—*2*.
 DR. JOHN PHILLIPS—King's College Hospital—*2*.
 DR. A. F. GILES—Chelsea Hospital for Women—*9.30*.
 DR. S. DODD—Chelsea Hospital for Women—*9.30*.

Tuesday July 28th

DR. J. BARRIS—St. Bartholomew's Hospital—*9.30*.
 DR. WALTER TATE—St. Thomas' Hospital—*to 5*.
 MR. H. CHAPPEL—Guy's Hospital—*0*.
 DR. COMYNS BERKELEY and DR. VICTOR BONEY—Middleness Hospital—*10*.
 DR. HERBERT SPENCER—University College Hospital—*0*.
 DR. HUGH PLAYFAIR—King's College Hospital—*2*.
 DR. T. W. EDEN and DR. C. H. LOCKYER—Charing Cross Hospital—*1.5*.
 MRS. VAUGHAN SAWYER—Royal Free Hospital—*to 5*.
 DR. H. H. FENTON—Chelsea Hospital for Women—*9.30*.
 DR. VICTOR BONEY—Chelsea Hospital for Women—*9.30*.
 DR. J. B. BANISTER—Chelsea Hospital for Women—*9.30*.
 DR. DRUMMOND ROBINSON—West London Hospital—*0*.

Wednesday July 29th

DR. W. S. A. GRIFFITH—St. Bartholomew's Hospital—*2*.
 MR. G. B. SMITH—Guy's Hospital—*0*.

Thursday July 30th

DR. H. WILLIAMSON—St. Bartholomew's Hospital—*9.30*.
 DR. WALTER TATE—St. Thomas' Hospital—*9 to 2*.

MR. H. CHAPPEL—Guy's Hospital—*0*.
 DR. DRUMMOND MAXWELL—London Hospital—*10*.
 DR. COMYNS BERKELEY and DR. VICTOR BONEY—Middleness Hospital—*10.30*.
 DR. GEORGE BLACKER—University College Hospital—*2*.
 DR. JOHN PHILLIPS—King's College Hospital—*2*.
 DR. H. G. PLAYFAIR and DR. EARDLEY HOLLAND—Metropolitan Hospital—*2*.
 DR. T. W. EDEN—Chelsea Hospital for Women—*9.30*.
 DR. F. L. PROSS—Chelsea Hospital for Women—*9.30*.
 DR. ARTHUR GILES and DR. J. B. BANISTER—Prince of Wales General Hospital—*10 to 4.30*.

Friday July 31st

DR. W. S. A. GRIFFITH—St. Bartholomew's Hospital—*0*.
 DR. G. H. D. ROBINSON and DR. S. DODD—Westminster Hospital—*2*.
 MR. G. B. SMITH—Guy's Hospital—*0*.
 DR. A. F. STABB and DR. G. F. DARWELL SMITH—St. George's Hospital—*0.5 to 1*.
 DR. HUGH PLAYFAIR—King's College Hospital—*2*.
 DR. T. W. EDEN and DR. C. H. LOCKYER—Charing Cross Hospital—*1.5*.
 MRS. WILLEY—Royal Free Hospital—*9 to 1*.
 DR. COMYNS BERKELEY—Chelsea Hospital for Women—*9.30*.
 DR. H. J. F. SIMON—West London Hospital—*0*.
 DR. ARTHUR GILES and DR. J. B. BANISTER—Prince of Wales General Hospital—*0.30 to 1.30*.

Saturday August 1st

DR. HERBERT SPENCER—University College Hospital—*0*.

Days and Hours to be announced

DR. JOHN FAIRBAIRN and DR. J. P. HEDLEY—St. Thomas' Hospital.
 DR. W. J. GOW—St. Mary's Hospital.

GENITO-URINARY SURGICAL CLINICS

Monday July 27th

MR. A. R. THOMSON—Guy Hospital—*0*.

Wednesday July 29th

MR. J. S. PARDOE—West London Hospital—*2*.
 MR. P. J. FREYER—St. Peter's Hospital—*2*.

MR. J. W. THOMSON WALKER—St. Peter's Hospital—*2*.

Friday July 31st

MR. F. SWINFORD EDWARDS—St. Peter's Hospital—*0*.
 MR. G. S. PARDOE—St. Peter's Hospital—*2*.
 MR. J. SWIFT JONES—St. Peter's Hospital—*2*.

SURGERY, GYNECOLOGY AND OBSTETRICS

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THE DIAGNOSIS AND SURGICAL TECHNIQUE TO BE EMPLOYED IN THE HANDLING OF ACUTE ABDOMINAL CONDITIONS ILLUSTRATING MANY INTERESTING POINTS IN DIAGNOSIS AND TECHNIQUE WITH ORIGINAL DRAWINGS

BY JOHN YOUNG BROWN, M. D. SAINT LOUIS, MISSOURI

I WOULD indeed be lacking in gratitude if I failed to express to the fellows of the Southern Surgical and Gynecological Association my deep appreciation of the great honor conferred upon me in electing me to the highest office within your gift. Until quite recently it was my intention to follow the usual custom on such occasions and to deliver to you a general address, but after reading and re-reading the masterful oration of my distinguished predecessor Dr. J. M. T. Finney delivered at the last meeting of this association, and hearing his equally scholarly address at the recent meeting of the American College of Surgeons in Chicago it seems to me that the subject matter usually covered in such addresses has been exhausted — at least for a time.

I therefore trust that you will pardon me if I depart from the usual rule and present to you a subject of my own selection, namely the diagnosis and surgical technique to be employed in the handling of acute abdominal conditions, illustrating many interesting points in diagnosis and technique with original drawings. Under this head, I shall consider —

First. Gunshot and stab wounds of the abdomen.

Second. Injuries to abdominal viscera, resulting from severe abdominal contusions.

Third. Acute intestinal obstruction.

I have selected the above-mentioned subjects for the reason that they constitute a distinct group of acute abdominal conditions where immediate operative treatment is mandatory, the mortality depending upon the time of operation and the technique employed.

With the exception of the last subject, acute intestinal obstruction, few individual operators have had the opportunity to draw conclusions from a large series of cases to be treated under the first two headings, namely gunshot and stab wounds of the abdomen, and severe abdominal contusions. I therefore, will present in detail certain points in the diagnosis and technique of this work which I have found of value in the handling of a large number of such injuries. I shall then take up some important technical methods which I have found of value in dealing with the equally serious pathology resulting from acute intestinal obstruction.

MEMBERSHIP IN THE CONGRESS

Any physician or surgeon in North America in good standing may become a member of the Clinical Congress by registering at any annual meeting and paying the registration fee.

Automatically the subscribers to **SURGERY GYNECOLOGY AND OBSTETRICS**, the official journal of the Congress, will receive invitations without request. Other members of the profession who desire to attend will receive formal invitations upon request to Franklin H. Martin, M. D. General Secretary 30 North Michigan Boulevard Chicago.

REGISTRATION FEE

A registration fee is required of each surgeon upon registration, at which time a membership card will be issued.

Unlike conditions prevailing in most medical societies, where annual dues are paid by each member without regard to his attendance at any meeting of the society the payment of a registration fee is required of a member of the Congress, only when he is in attendance at an annual session.

The purpose of this fee is to provide funds to meet the expenses of preparing for and conducting the annual meeting, in order that no financial burden may be imposed upon the members of the profession in the city entertaining the Congress. Judging from past experience, the amount received from such fees will be barely sufficient for the purpose, so that payment of the fee is expected of all who register.

MEMBERSHIP CARDS

Each surgeon who desires to attend the clinics and evening sessions must register at headquarters and secure a membership card. Admission to all clinics and evening sessions will be strictly limited to members of the Congress upon presentation of such membership cards.

RESERVED TICKETS

Reserved tickets for all clinics and demonstrations, properly numbered and couponed, corresponding to the capacity of each operating room, will be issued. Provision will be made by which these tickets may be arranged for in advance, based, of course, on the tentative program. In the contingency of the popularity

of certain clinics resulting in an unusual demand for tickets thereto the tickets will be distributed in order of application day after day until all applications have been satisfied.

SPECIAL RATES

Special reductions of 25 per cent to the members of the Congress and immediate families are announced by the International Mercantile Marine Lines for the trip to England after July 9th and on other lines after July 15th. The same reduction applies for the return trip up to August 15th on the former lines and to August 20th on the latter. This discount will of course not be allowed to apply on bookings to bring them below the minimum rate. Further information can be had from Mr. J. P. McCann, Transportation Manager Marbridge Building, New York City.

LONDON HOTEL

In addition to the Cecil and Savoy there are a large number of hotels centrally located which have agreed to make advance reservations for members of the Congress. These hotels include among others, the Carlton, Metropole Grand, Victoria, Grosvenor Imperial, Russell Waldorf, Ritz, Piccadilly Great Central, First A class Richelieu, St. Ermins Hans Crescent, Windsor Langham Royal Palace.

While there will be no difficulty in securing hotel accommodations somewhere in London during the week of the Congress, it is advisable to make reservations early.

NOTICE.—It is proposed to arrange a golf match between teams representing London surgeons and North American surgeons, on one of the afternoons during the week of the Congress. Arrangements will be made for the matches to take place at seven or eight of the numerous courses around London. In this way it will be possible to arrange for 50 or 60 couples to take part without crowding, as the number of couples playing on the same course will be limited to ten or twelve.

Members of the Congress who desire to play are requested to send their names and handicap to Mr. Herbert Paterson, at the London Office of the Congress Wimpole St. W.



Fig 2

phragm. While the majority of wounds of this type are readily recognized I have seen quite a number of such injuries in which the diagnosis was difficult. In all stab and gun shot wounds, where the bullet or knife enters as low as the sixth interspace irrespective of symptoms, injury to the diaphragm should be suspected and such wounds should be explored. The exploration should be made preferably through the abdomen. Should exploration be made through the chest and an injury to the diaphragm be found, it would be impossible to tell without opening the abdomen, whether or not fatal perforations of hollow viscera existed unless there is present severe shock indicating hemorrhage. The abdominal route is therefore the method of choice, as it will enable the operator to view the damage and apply at once proper methods of repair to both abdominal viscera and diaphragm. This is the only certain method of making a correct diagnosis in cases of this character.

Before taking up the technique to be employed in the handling of these cases, I shall call your attention to several illustrations of the various types of wounds coming under the classification above outlined. Fig 2 illustrates a type of penetrating and perforating wound. It will be noted that the bullet entered the peritoneal cavity at the

lower border of the ribs on the right side penetrating liver, gall bladder and stomach, the wound of exit being at the outer border of the left rectus muscle. This patient was operated on one hour after he was shot and his recovery was uneventful.

Fig 3 shows a complicated stab wound of the chest and abdomen in which may be seen the spleen, small intestine, omentum, stomach and colon, prolapsed through the diaphragm into the pleura. There were multiple visceral injuries in this case but the patient recovered following a combined operation.

Treatment There is but one treatment of such injuries and that can only be accomplished by means of immediate abdominal section and careful repair of all damage to viscera.

The surgical treatment of gunshot and stab wounds of the abdomen may be considered under four heads

1. Preparation and examination of patient.
2. Method of locating injuries to peritoneal viscera.
3. Repair of such injuries.
4. After treatment.

Preparation and examination of patient As many of these cases are received profoundly intoxicated it is advisable unless the patient has vomited blood to wash out the stomach before the anesthetic is given the

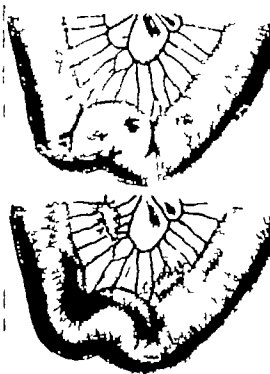


Fig. A. Multiple gunshot wounds of the small bowel. Patient suffering fatal injury with no immediate symptoms indicating the seriousness of the injury. B. Multiple gunshot wounds of mesentery. Patient suffering fatal injury with immediate symptoms of hemorrhage and shock.

GUNSHOT AND STAB WOUNDS OF THE ABDOMEN

Classification Gunshot and stab wounds of the abdomen may be classified under three heads:

1. The simple penetrating wound or a wound where the knife or bullet penetrates the peritoneal cavity without injury to abdominal viscera.
2. Penetrating and perforating wounds or wounds where the knife or bullet penetrates the peritoneal cavity and injures either solid or hollow viscera or both.
3. Complicated wounds, or wounds in which the entrance to the abdominal cavity is made by knife or bullet through chest, pleura, and diaphragm with or without injury to abdominal viscera.

Diagnosis It is at times exceedingly difficult to differentiate between the simple

penetrating wound and the penetrating and perforating wound. I have time and again operated on a patient whose abdomen has been penetrated by a bullet with both a wound at entrance and exit, where no damage to peritoneal viscera was found when the abdomen was opened and careful search for perforations was made. Such wounds give few or no symptoms. Again, I have operated on many cases in which there were present no symptoms indicating the serious nature of the injury for the reason that the patient was not bleeding as the perforations were in the bloodless portion of the bowel.

Fig. 1 illustrates the difficulties encountered in differentiating between the two types of wounds. The simple perforating wound is the type of wound that the military surgeon often reports as recovering from undoubted multiple bowel injuries, without operation. The civil surgeon recognizes that there is no method of telling whether injury to hollow viscera has occurred, unless perforations are demonstrated by means of an abdominal section and careful search. I therefore seriously question the diagnosis in the reported recoveries from such injuries under the expectant plan of treatment.

In the penetrating and perforating wounds giving no alarming symptoms, delay in exploring is the usual rule, and when the exploration is at last made the patient is found to be suffering from a lethal peritonitis. In contradistinction to the symptoms occurring in the above-mentioned cases, we have another type of penetrating and perforating wound, giving immediate and alarming symptoms. In these cases multiple perforations of the mesentery are present and profuse bleeding occurs at once bringing about profound symptoms of shock. Such cases demand immediate operative treatment.

In the penetrating and perforating wounds with multiple injuries to liver, spleen, hollow viscera and mesenteric vessels, the diagnosis, of course, is simple.

Complicated wounds resulting from both knife or bullet are wounds in which the peritoneal cavity is penetrated by the entrance of the bullet or knife through the chest, the abdomen being opened through the dia-

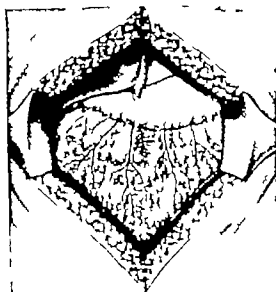


Fig. 6.

method I have found most satisfactory is as follows

As soon as the abdomen is opened the liver and spleen are examined, and if hæmorrhage from either organ exists it should be properly dealt with. If such hæmorrhage can not be controlled through the median incision, it is advisable to cut the rectus at right angles. This procedure, while by no means ideal, will enable the operator to quickly control the hæmorrhage, and produces less shock than would follow the forcible retraction of the median incision and the rough handling of the injured viscera. The anterior border of the stomach is now searched for perforations. If no perforations are found, a rent is made in the gastrocolic omentum opening into the lesser peritoneal cavity. Through this opening the posterior wall of the stomach is examined and any injury to the stomach or pancreas is noted.

Fig 5 shows the technique. The wound in the omentum is at once closed in the manner shown in Fig 6. The transverse colon is next examined and particular attention is paid to both the splenic and hepatic flexures, as wounds in this locality are frequently overlooked. Throwing back the transverse colon, the small bowel will be seen to emerge through



Fig. 7.

the transverse mesocolon as is shown in Fig 7. Lifting up the small bowel at the angle of Treitz, the operator examines it inch by inch as the assistant returns it to the peritoneal cavity (Fig 8). All perforations found are immediately repaired, and when the small bowel is traced to the ileocecal valve the operator may feel confident that no perforations have been overlooked. The cecum, ascending and descending colon, and sigmoid are next examined and if, in the judgment of the operator it is necessary the patient is placed in the Trendelenburg posture, so that any wounds that may exist in rectum or bladder may be located and repaired. I have found this method of search simple and satisfactory. If the patient is profoundly shocked it is generally my custom to start irrigating the abdominal cavity with saline, as soon as the peritoneum is incised. Fig 9 will illustrate the method by which this is accomplished. You will note the stab wound above the pubis with the drain placed in the vesicorectal pouch and the saline flowing from the tube. This irrigation is not done for cleansing but for stimulation. It is astonishing how quickly a badly shocked patient will show signs of improvement as the hot saline is absorbed. I called attention to the value of this procedure in a paper read



Fig. 3.

removal of the stomach contents will greatly aid both anesthetist and operator. The abdomen should be prepared in the usual way and the wound of entrance should be carefully explored. No information whatever can be obtained by the use of the probe.

Fig. 4 shows the proper method of incising the wound of entrance and tracing the wound into the peritoneal cavity with the sterile finger. On the left-hand side of this illustration may be seen a classical stab wound of the



Fig. 4.



Fig. 5.

abdomen showing the prolapsed small bowel and the omentum protruding from the wound. Before returning prolapsed bowel and omentum, it should be carefully cleansed with normal saline. Occasionally you will find a loop of strangulated bowel in the stab wound. The strangulation is readily relieved by enlarging the wound.

The patient having been prepared, the abdomen is opened through a median incision, beginning an inch below the ensiform cartilage and extending an inch below the umbilicus. This incision gives free access to the abdominal viscera and can be lengthened in either direction if conditions demand.

Method of locati injury. There is nothing of more importance in dealing with injuries of this type than a thorough examination of the entire peritoneal contents. It is a well-known fact that unless a systematic search for visceral injuries is made perforations will be overlooked and the overlooked perforation is, as a rule, the one responsible for the patient's death. It is therefore, necessary that such a search be made in a manner that will enable the operator to handle the viscera as gently and rapidly as possible without adding to the already existing shock. The

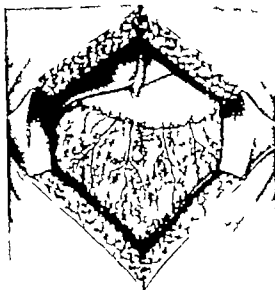


Fig. 6



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As soon as the abdomen is opened the liver and spleen are examined, and if hæmorrhage from either organ exists it should be properly dealt with. If such hæmorrhage can not be controlled through the median incision, it is advisable to cut the rectus at right angles. This procedure, while by no means ideal, will enable the operator to quickly control the hæmorrhage and produce less shock than would follow the forcible retraction of the median incision and the rough handling of the injured viscera. The anterior border of the stomach is now searched for perforations. If no perforations are found, a rent is made in the gastrocolic omentum opening into the lesser peritoneal cavity. Through this opening the posterior wall of the stomach is examined and any injury to the stomach or pancreas is noted.

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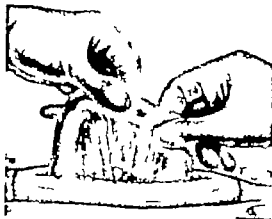


Fig. 8.

before the Mississippi Valley Medical Association on Oct. 12 1904. Dr F Wylys Andrews of Chicago has since devised a special irrigating apparatus for this purpose.

In the repair of perforations of the bowel I have found that they can best be closed either by a purse-string suture or by a through and through stitch, supplemented by the Lembert stitch. Not infrequently multiple perforations are found in close proximity necessitating bowel resection. Fig 10 illustrates a rapid method of bowel resection in such cases. The bowel is folded on itself and the mesentery is clamped with a strong forceps the segment of injured bowel is rapidly removed, and a cobbler's stitch is now placed to control hemorrhage. The anastomosis can then be made with the Murphy button or suture (Fig 11).

It is far better to resect in such cases than to repair with suture if there is the slightest question regarding the blood supply to the bowel.

WOUNDS OF THE LIVER

Gunshot wounds of the liver are seen far more frequently than stab wounds. This is explained by the fact that the majority of people are right handed, hence with two individuals facing the knife in the right hand would naturally strike the left side. Hemorrhage from liver wounds at times is profuse but as the blood pressure in the liver is the lowest in the body such wounds have a tendency to cease bleeding without inter-

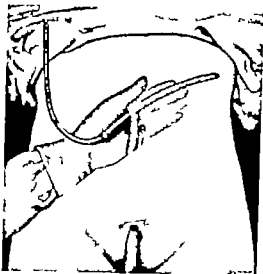


Fig. 9.

ference unless a large vessel is injured. I again wish to call attention to Fig 2 which illustrates a method used to control hemorrhage due to a gunshot wound of the liver in which the gall bladder and stomach were also injured. You will note the catheter introduced through the wound of entrance and through the wound in the liver after the gall-bladder has been removed. You will also see the strip of gauze threaded through the loop in the catheter ready to be drawn through the liver and the wound of entrance. This accomplishes the double purpose of hemostasis and drainage.

Fig. 12 shows a method of controlling hemorrhage from the liver by the use of gauze and suture in combination.

Fig. 3 shows a method of controlling wounds of the liver by the suture alone. In this connection let me say that no special needle is necessary for this work. If a large needle is threaded with No. 3 catgut and we sew with the eye of the needle instead of the point we get the same results that would be gotten by the use of the many special needles that have been devised for this work.

GUNSHOT AND STAB WOUNDS OF THE SPLEEN

Gunshot and stab wounds of the spleen are quite common particularly the latter. It is

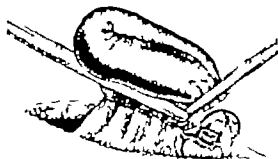


Fig.

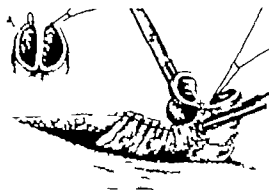


Fig.

important if possible to save the spleen. This can often be done by sutures and gauze. Fig. 14 illustrates a method of reinforcing the sutures by utilizing the omentum. To my former associate Dr. Kirchner belong the credit for devising this technique which has been the means of saving the spleen in a number of cases without the use of which splenectomy would have been necessary. If the rent or wound in the spleen is such that it can not be repaired by suture and omental reinforcement the spleen should be removed. Fig. 15 shows the spleen delivered through the abdominal incision, ready for removal. Fig. 16 shows the interlocking figure of eight sutures in place to control haemorrhage from the stump after removal of the spleen.

INJURIES TO THE DIAPHRAGM

The handling of complicated wounds is at times difficult as the diaphragm is invariably

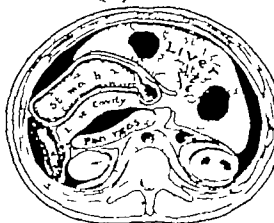


Fig.

injured. Prolapse of viscera into the chest is the rule and we have to deal not only with the pleura and diaphragm but with the abdominal contents as well. If a loop of bowel is prolapsed into the pleural cavity and the bowel is perforated the pleura is always infected. A wound of the diaphragm can frequently be repaired through the chest wound and when the wound in the chest is sufficiently large to permit such repair it should be done (Fig. 16). As the abdomen must be opened in all such wounds the combined method is the method of choice. Fig. 17 illustrates the diaphragm being repaired through the abdominal incision. Note the forceps pulling the diaphragm down.

It is astonishing how slightly the patient is affected by a pneumothorax of one side. I have often viewed through a huge chest wound the lung partially functioning with the patient living tranquilly on the table. After the diaphragm has been repaired in

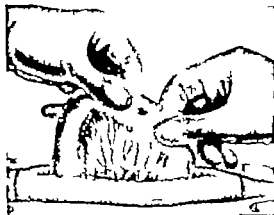


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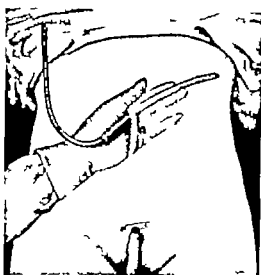


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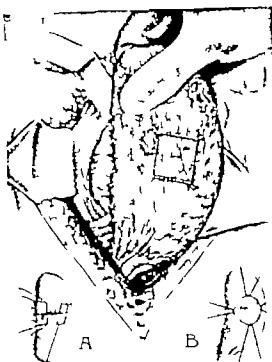


Fig. 4

automobile accidents, etc. The viscera usually involved are the liver, spleen, small bowel, mesentery and bladder. In many of these cases, profound symptoms of shock immediately develop. In others, the symptoms are slight. Careful examination of such patients will, as a rule, indicate that injury to viscera has occurred. Early exploration should be the rule in all such injuries. To show that severe damage to viscera can exist without producing alarming symptoms, I shall briefly relate a case.

A young boy, seventeen years old, who came under my care at the St. Louis City Hospital. While returning from swimming, he fell heavily upon a large boulder striking his left side. Although he suffered temporarily from shock, he was able to walk to his home, a distance of eight blocks, one-half an hour after receiving the injury. Three days after the accident he was admitted to the hospital with high temperature, rapid pulse, and on examination a large mass was found on the left side in the region of the spleen, extending well over the midline. The expectant plan of treatment was applied in this case. Twenty-four hours after admission the capsule of the spleen ruptured, and

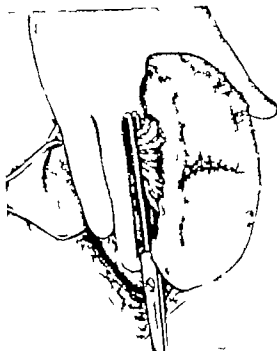


Fig. 5

although splenectomy was immediately done, he died a few hours later as the result of hemorrhage and shock due to a large rent in the spleen.

Another most interesting case illustrated by Fig. 5 was admitted to the hospital with the following history. This patient, telegraph operator by occupation, while intoxicated, was struck by an automobile and rendered unconscious. Regaining consciousness, he came to the hospital and was admitted as a walker. Upon examination it was found that he had sustained a fracture of the upper third of the right arm, abrasions and contusions of the legs and hips. At this time there was no evidence of the existence of internal injuries. When admitted to the hospital at 3:30 A.M., his pulse was 60, respirations 22, temperature 98.5°. On the following afternoon, his pulse was 84, respirations 24, and temperature 99°. He complained of abdominal pain and was unable to urinate. The abdomen became distended and tympanitic. The recti muscles became rigid and there was dullness in both flanks. He complained of intestinal cramps and vomited fluid containing undigested food. His pulse was 88, respirations 24, and temperature 100° Fahrenheit. A diagnosis of obstruction was made and the abdomen was immediately opened. The mesentery was found bruised in several places, and in one place there was a large rent extending from the root of the mesentery to the border of the intestine. A loop of small bowel was found prolapsed through the mesenteric rent



Fig. 3

junes to abdominal viscera should be searched for and properly handled. If there has been no contamination of the pleural cavity the chest wound should be closed without drainage. If however infection of the pleura is suspected drainage should be instituted.

It has been my invariable custom to drain all gun shot and stab cases where there was extensive soiling of the peritoneal cavity and where severe hemorrhage existed. The drainage is accomplished by means of a glass tube introduced through a stab wound above the pubis and placed at the most dependent portion of the vesicorectal pouch, as illustrated by Fig. 19. In the lower left hand corner is shown the improper method of placing the drain, the cut above showing the proper method.

Closing the abdominal wound. If the patient is badly shocked the wound should be closed with a through and through suture as it can be more quickly applied than the layer suture. Although it would seem out of place to illustrate the technique of a through and through closure before so distinguished a body of surgeons, my observation has been that few operators make such a closure correctly. Fig. 20 illustrates the method taught by that great pioneer and master abdominal surgeon the late Joseph Price. The closure is made with a long, straight needle the skin is retracted and the needle is made to pierce the margin of the skin and body of the rectus muscle, catching the edge of the peritoneum. The needle next traverses the opposite side in

the same manner. When the sutures are all placed the ends are lunched and the wound is elevated by traction. When the sutures are tied, it will be seen that the peritoneum will approximate and perfect coaptation of like tissues from below upward is accomplished.

A beautiful coaptation of skin is obtained by using the "gliding approximation" taught us by the lamented Price. If the patient is not too badly shocked, the ordinary closure should be made.

MORTALITY

The mortality in gunshot and stab wounds of the abdomen is high—approximately 50 per cent. Dr. Kirchner and I are now at work carefully tabulating the large number of cases coming under our care during our service at the St. Louis City Hospital. We hope to publish shortly a complete analysis of the histories of all our cases. Granting a mortality of 50 per cent following operative treatment of such injuries I candidly believe that 100 per cent mortality would result from the expectant plan of treatment in all cases where multiple bowel perforations existed.

As the after treatment of gunshot and stab wounds is practically the same as that applied to the treatment of the conditions which are next to be considered, I will discuss it later.

INJURIES TO ABDOMINAL VISCERA RESULTING FROM SEVERE ABDOMINAL CONTUSIONS

Such injuries are as a rule, the result of falls, kicks, or blows to the abdominal wall,

cases of rupture of the bladder have come under my observation. Three of these were extraperitoneal. All recovered following operation. Four were intraperitoneal ruptures with two recoveries. I may add here that one of these cases was operated on by me in 1888. Of the complicated cases, namely those where intraperitoneal rupture of bladder exists, associated with severe crushing of pelvic bones, all died.

ACUTE INTESTINAL OBSTRUCTION

At the last meeting of this Association Dr Alexus McGlannan of Baltimore presented a splendid clinical study of 181 cases of acute intestinal obstruction. In this paper he clearly demonstrated the importance of the early recognition of this condition and its prompt relief by surgical measures. In a recent paper read before the American Association of Obstetricians and Gynecologists, Dr Walter C G Kirchner reported a careful study of seventy cases of bowel obstruction occurring during his service and the service of the writer at the St. Louis City Hospital. From a study of these cases, he arrived at practically the same conclusions as those of

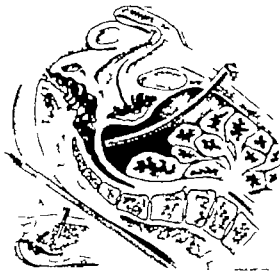


Fig. 9

Dr McGlannan. Both the studies of Kirchner and McGlannan show a high rate of mortality and that a large majority of such cases reach the operating table late. In the seventy cases reported by Kirchner forty seven were due to strangulated hernia. Of the forty seven it was necessary to resect

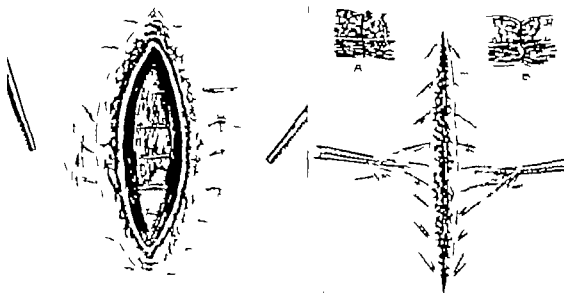


Fig. 20

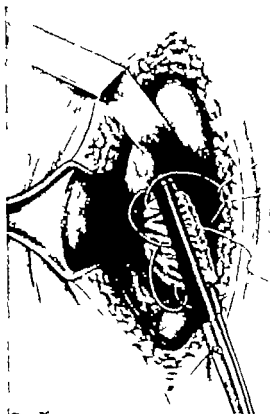


Fig. 6



Fig. 7

and tightly constricted. The obstruction was reduced and the mesentery was repaired. No further injuries were found. The patient made a rapid recovery.

The two cases reported above illustrate the fact that severe and fatal injuries of this type may exist with practically no symptoms. In contra-distinction to the symptoms found in the two cases above reported, Fig. 22 shows a severe injury to mesentery and jejunum.

This patient, well nourished male 20 years old, as admitted to the hospital twenty minutes after having been run over by a wagon. He gave evidence of profuse hemorrhage and was badly shocked. The abdomen was immediately opened and the injury to the jejunum and mesentery as here shown was found. The mesentery was repaired, resection of the bowel was made, and an end-to-end anastomosis done with the Murphy button. The patient died, twelve hours after operation, of shock.

RUPTURE OF THE URINARY BLADDER

Rupture of the urinary bladder almost invariably results from abdominal contusions. Such ruptures may be extra or intraperitoneal. Uncomplicated injuries to the bladder of this type are readily recognized and respond quickly to early operation. The complicated types, namely those in which there exists severe injury to pelvic bones and to abdominal viscera, give a high rate of mortality. Ten

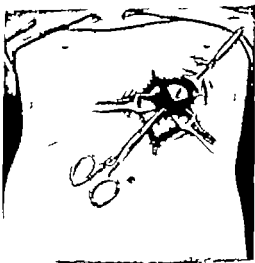


Fig. 18

cases of rupture of the bladder have come under my observation. Three of these were extraperitoneal. All recovered following operation. Four were intraperitoneal ruptures with two recoveries. I may add here that one of these cases was operated on by me in 1888. Of the complicated cases, namely those where intraperitoneal rupture of bladder exists associated with severe crushing of pelvic bones all died.

ACUTE INTESTINAL OBSTRUCTION

At the last meeting of this Association Dr. Alexis McGlannan of Baltimore presented a splendid clinical study of 181 cases of acute intestinal obstruction. In this paper he clearly demonstrated the importance of the early recognition of this condition and its prompt relief by surgical measures. In a recent paper read before the American Association of Obstetricians and Gynecologists, Dr. Walter C. G. Kirchner reported a careful study of seventy cases of bowel obstruction occurring during his service and the service of the writer at the St. Louis City Hospital. From a study of these cases, he arrived at practically the same conclusions as those of

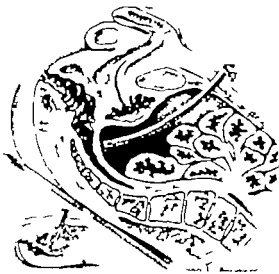


Fig. 9.

Dr. McGlannan. Both the studies of Kirchner and McGlannan show a high rate of mortality and that a large majority of such cases reach the operating table late. In the seventy cases reported by Kirchner forty-seven were due to strangulated hernia. Of the forty-seven it was necessary to resect

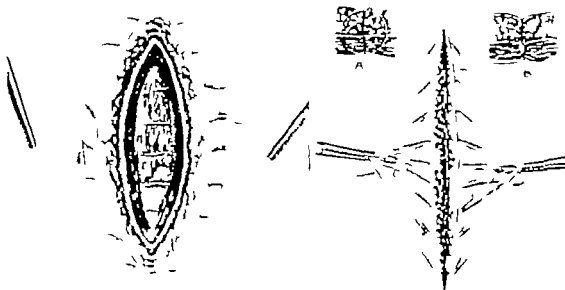




Fig. 1

gangrenous bowel in fifteen and in two enterostomy was done. The mortality was 28.8 per cent. Of the various obstructions not due to hernia there were twenty-three, one in which resection was necessary and in three enterostomy was performed. Mortality was 52 per cent. In ten cases of obstruction due to post-operative adhesions bowel resection was necessary, in one, and in one enterostomy was done. The mortality was 50 per cent. Four cases of obstructions due to pre-operative adhesions, in one of which enterostomy was done resulted in a mortality of 50 per cent.

From the frightful mortality resulting from this condition we can reach but one conclusion, namely, that the general practitioner is badly in need of enlightenment on this subject. In our series of cases worse rather than unusual conditions were found. Fig. 20 illustrates the condition found in a case which I briefly report.

The patient, 35 years old, was admitted to the hospital profoundly shocked and vomiting fecal matter. The abdomen was greatly distended. His pulse was 96, his temperature was subnormal. He was immediately taken to the operating room, and on opening the abdomen a huge gallstone was found blocking the ileum eighteen inches above the ileocecal valve. One of the interesting features of this case was that the patient had Meckel's



Fig. 2.

diverticulum. This, however, had nothing to do with the obstruction. The gallstone and diverticulum were both removed. The patient made an uninterrupted recovery.

Fig. 24 illustrates most interesting case that of a young man who came to the hospital with the history of eight days illness. The boy was the son of a doctor and his father stated that from early infancy he had suffered at frequent intervals from intestinal colic and vomiting, usually relieved by castor oil. On admission to the hospital, his condition was critical. On opening the abdomen, his appendix was found attached to Meckel's diverticulum, and through the opening made by this attachment the small bowel had prolapsed, twisting the pedicle of the Meckel and bringing about an acute obstruction. The diverticulum was gangrenous. The appendix and diverticulum were quickly removed, thus relieving the strangulation, and the boy made a recovery. Fig. 5 shows the gangrenous diverticulum and appendix.

Treatment. No hard and fast rules can be laid down relative to the treatment of acute obstruction so much as we can not be laid on the necessity of preparing such cases for operation. As the majority of them come in profoundly toxic and vomiting fecal matter stomach lavage should invariably be

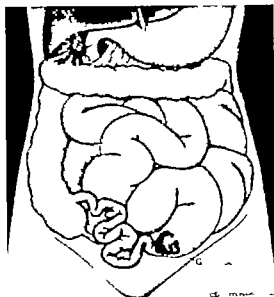


Fig. 3.

done before the anæsthetic is given. The surgical technique should be carried out as rapidly as possible consistent with thorough work. I can not too strongly emphasize the importance of draining the bowel of its highly toxic contents in every case.

Fig. 26 shows a rapid method of accomplishing this drainage in cases requiring re-



Fig. 24. Showing appendix attached to Meckel's diverticulum, small bowel impinged under loop, twisting pedicle of diverticulum, which was found to be gangrenous at operation.

section. You will note the tube in the proximal bowel. While the assistant is draining the distended gut above the constriction, the operator is tying off the mesentery. It will be seen that by this method no time is lost and when the resection has been accomplished and the distal end made ready for anastomosis, the distended loop above has been drained of a large quantity of material which if left, would greatly interfere with the patient's



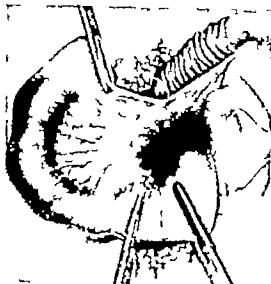


FIG. 26. Method of draining distended loop above block.

recovery. I reported this method in a paper read before the Missisippi Valley Medical Association, in 1904.

In handling gangrenous bowel found in the sac of a strangulated hernia I have found the method which I will now describe of great value in making an artificial anus. Fig. 27 shows the sac opened and the loop of gangrenous bowel delivered. The constriction having been relieved a wide resection well back into healthy bowel is done in the following manner. A heavy clamp is made to perforate the mesentery on either side at its intestinal margin and is then closed tightly thus controlling the hemorrhage. Two clamps are then placed in order to prevent the healthy bowel from receding into the peritoneal cavity and two other clamps are placed to prevent leakage from the bowel to be removed. When these clamps are placed the gangrenous gut is quickly cut away. Fig. 28 shows the two ends of bowel fixed in the hernial opening; the clamp on the mesentery filling the double purpose of controlling the mesenteric hemorrhage and holding the two ends of bowel in position. In the left hand corner of Fig. 28 will be seen a rubber tube into which one half of a Murphy button has been inserted. A tube of this type is



FIG. 27

then introduced into the lumen of both bowels and retained there by means of a purse string suture.

Occasionally we find a knuckle of small bowel tightly constricted and gangrenous in the sac of a femoral hernia. In all such cases, where it would be unsafe to return the bowel to the peritoneal cavity and resection has to be done it has been my practice to make a supplementary abdominal incision, relieving the constriction, pulling the bowel through the abdominal wound, and resecting in the manner described above (Fig. 29). This method makes resection very much safer than by operating at the hernial site. When resection is done at the hernial ring there is always danger of interfering with the approximation whether made with the button or suture, returning the bowel to the peritoneal cavity.

After-treatment.—After treatment of all

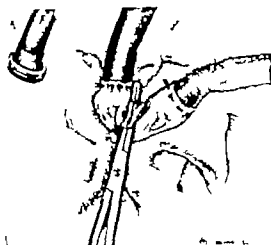


Fig. 28.

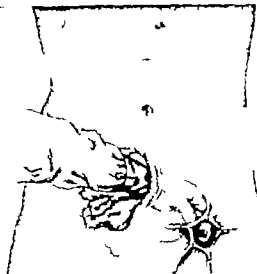


Fig. 29.

of the types of cases above considered should be as simple as possible. It is our custom unless there are special contra indications to allow such patients to have all the water they desire. Strychnine is never used and morphine is rarely needed.

Proctoclysis, tap water being used by the Murphy method, I have found of value. The Fowler position I have practically abandoned

as a method of treatment, not only in the types of injuries above discussed but in my other acute work.

In conclusion I wish to thank the fellows of the Association for their patience in listening to the lengthy presentation of this subject.

CALCULOUS ANURIA, WITH REPORT OF TWO CASES¹

B. LINCOLN DAVIS, M. D. Boston
 Assistant Teaching Surgeon, Massachusetts General Hospital

SUDDEN and total suppression of the urinary secretion as the result of obstruction by calculus is a serious and dramatic surgical emergency which requires prompt and intelligent treatment. It is by no means such a great rarity the literature abounds in scattered case reports and probably a majority of the experienced surgeons of this country have each had several cases. The American text-books, however for the most part dismiss the subject with a scanty paragraph. It is a condition which any one of us is liable to run into at any time without warning and which we should be prepared to meet intelligently. The collated experience of others has brought out certain facts in regard to the condition which are interesting and important.

Anuria is a symptom which has been described by medical writers from the earliest times its pathology however long remained in densest obscurity and is still far from being fully understood. Alpin in the sixteenth century was the first to call attention to anuria of strictly obstructive type.

The treatment in the early days was entirely expectant and a number of cases of calculous anuria are reported in which spontaneous expulsion of the stone was followed by what the French call a urinary débâcle and cure. Such happy results, however were the exceptions to the melancholy general rule and with the advancement in the art of surgery it was but natural that operative measures should be resorted to for relief in this dangerous and usually fatal condition. Guermontprez (1) a French surgeon is credited with being the first to operate for calculous anuria, in 1870. He performed left lumbar nephrotomy finding the kidney and pelvis greatly dilated and the ureter blocked by a stone the right kidney being absent. Death resulted on the third day. Bardenheuer is credited with the first successful case, in 1882. Henry Morris, that brilliant pioneer of renal surgery was an early

operator for this condition. In his text-book of diseases of the kidney and ureter he discusses the subject of calculous anuria in considerable detail. He collected in 1898, 97 cases from the literature. In 48 of these no operation was performed 10 recovering and 38 dying a mortality of nearly 80 per cent. In 49 cases in which operation was performed the mortality fell to 51 per cent. Many operative cases have been published since Morris' compilation with a steadily diminishing mortality. The mortality statistics depend largely upon the stage of the disease reached when surgical intervention was undertaken. Early writers counselled waiting until the fifth or sixth day of anuria before interfering surgically with the hope of spontaneous relief. It was observed that a patient would often remain in comparative well being and comfort for five to six days, with total anuria, before the advent of uræmic symptoms. This relatively symptomless period was called the period of tolerance. Succeeding writers kept cutting down the period of waiting until the sound advice was pretty generally promulgated that it was better to operate at once. In recent times, with the advent of the cystoscope and ureteral catheter a number of successful cases have been recorded which were treated by the ureteral catheter alone. These somewhat fortuitous results have encouraged certain authorities to advocate the use of the ureteral catheter as a means of treatment, at least as a preliminary measure. That the ureteral catheter has an important place in the diagnosis and treatment of this condition cannot be gainsaid but that it will often be of permanent curative value is, I think doubtful.

What is calculous anuria? Calculous anuria is the complete suppression of urinary secretion by obstruction of the renal outlet by one or more calculi. It occurs under the following conditions:

When a ureteral or pelvic calculus ob-

structs a congenitally single kidney or one whose fellow has been removed by operation or destroyed by disease.

2. When both kidneys are blocked by ureteral or pelvic calculi.

Many authorities maintain that anuria may and does, occur under a third condition so-called reflex calculous anuria, i. e. that if one kidney is blocked by a calculus a reflex inhibition may cause cessation of function of the opposite kidney, although the latter remain unobstructed. This is some what of an academic question which has been much argued pro and con it is not, however without practical importance and I shall refer to it in some detail later.

The clinical aspects of calculous anuria with some of its diagnostic and operative pitfalls are well exemplified by two personal cases in which the final results were favorable. The clinical histories of these cases were as follows:

CASE C. D. C. N. 835 E. S. Mass. Genl. Hosp. 43 years, widow brought to clinic room at 15 F. M., September 7, 1909.

Previous history. Unimportant except that she has had three previous attacks of anuria of less than one day's duration during last month. No pain or other urinary symptoms. Two days ago seized with sudden severe knife-like pain in left loin which radiated into groin came on when she was going to bed. She vomited and felt chill. Pain was not relieved by morphin. One-half hour after onset of pain felt as if something gave way in left loin, with slight relief. She had passed no urine since the night of September 5th. Pain has persisted but is less severe. Catheterized twice by local doctor who obtained no urine. Bowels moved today vomited yesterday.

Examination. Well developed and nourished woman. Pupils very small and react very slightly. Tongue coated teeth false throat negative. No adenopathy. Heart soft systolic murmur at base. Lungs negative. Abdomen soft and distended. Liver edge two inches below costal margin nipple line. In left loin there is moderate amount of spasm and tenderness. No costovertebral tenderness. Knee jerks present and lively. No edema.

Urine. Examined negative except for small polymorphous. Temperature 99.0 pulse 90 respirations 20 white count 6000. Patient catheterized with urine obtained, sediment of which showed numerous leucocytes and small round cells rare blood-corpuscles and granular casts. Patient was put to bed given morphin, fluids forced and hot fomentations applied to left loin. Catheterized next morning and no urine obtained. Patient states

that her face feels swollen, no other signs symptoms of uremia. X-ray taken negative for stone in kidneys ureters, or bladder. It was decided to operate without further delay. This was on Monday morning, 11 of urine only having been obtained since the previous Friday evening sixty hours. Left kidney exposed through a loin incision, found much enlarged, congested and purple in color. A

nephrotomy was done, and when the pelvis was reached there was a gush of bloody urine estimated at several ounces. The pelvis and ureter were then explored digitally but no stone felt. There was considerable venous oozing from the cut surface of the kidney as well as from its capsule. Two small gauzes were packed into the nephrotomy wound and two large gauzes were packed about the kidney. Patient made good recovery from ether. There was considerable staining of the dressing with distinct urinous odor. In the afternoon of the day

of operation the patient began to void urine naturally on the third day after operation she voided 30 oz. On the fifth and sixth days she voided nothing though there was constant desire to do so. Patient had considerable pain and appeared quite sick. There was slight edema of the face. There was profuse urinary leakage from the wound. On the sixth day patient passed about 20 small stones, the largest of which was the size of a green pea. After that urination became free and the amount draining from the wound very slight. On the thirteenth day the drainage from the wound which had ceased, began again and the patient was unable to void. She finally passed a small stone on this day and another three days later. Normal urination had again established itself. Cystoscopy at this time showed a somewhat inflamed bladder with dilated, ragged-looking left ureteral orifice. No sign of right ureteral orifice could be found. There was no excretion of indigo-carmin during an observation of twenty minutes. Colorless urine containing particles, was seen to issue from the left orifice at regular intervals. On the thirty-first day two more small stones were passed stones were passed daily for the next five days. Patient was discharged to Waverley on the forty-ninth day, the wound healed solidly there was no pain and the general health very good. The urine at this time was normal. I have seen the patient several times since and her health continues excellent she has passed no more stones. A cystoscopic examination made on February 3, 1910 showed a tiny slit in the position that corresponds to that of the right ureteral orifice. It remained absolutely inactive and it was impossible to engage. No. 6 ureteral catheter in it. The left orifice appeared active and normal.

CASE J. F. F. No. 86393 E. S. Mass. Genl. Hosp. 73 years, single, machinist. This patient was admitted through the accident room at 15 F. M., December 5, 1909 from the Lakeville Sanatorium with the diagnosis of anuria. Family history several aunts and uncles died of tuberculosis. Previous history diphtheria in childhood tuber

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The pelvis as then most thoroughly searched for stone without result a bougie was passed to the bladder without obstruction. A partly broken down lymph-gland lying near the ureter which was at first thought to be a stone removed. The peritoneal cavity was accidentally opened but immediately closed by suture. The nephrotomy wound was packed with gauze, the clamp removed, and the wound closed with drainage. The operation was started under spinal anesthesia this was satisfactory at first, but the traction necessary to free the kidney caused pain and ether was substituted for it and maintained to the end. There was again considerable shock after operation. The patient made a slow but steady convalescence and was discharged on February 9 1913 to the Lakeville Sanatorium in excellent condition, with a very small granulating wound in the left side wound in right loin healed.

The final X-ray plates still showed questionable shadow in the region of left kidney.

The patient has continued to improve since discharge and is now in excellent health. The urine is normal and the wound are healed.

He was shown at the recent meeting of the American Urological Association in Boston.

These two cases are excellent examples of calculous anuria and although the operations were in neither case all that might be desired in that the stones were not found and removed at operation yet the outcome in both was very satisfactory and shows the paramount importance and value of drainage as a life saving measure.

In the first of these cases we have to the best of my knowledge and belief a congenital solitary kidney blocked by a mass of small stones in the ureter with resulting anuria. In the other case we have the active kidney blocked by a stone in the pelvis with complete destruction of its fellow by an old tuberculous process.

In this latter case I read the signs and symptoms all wrong. The X-ray shadow in the region of the right ureter the impossibility of catheterizing the right ureter together with the ease of catheterizing the left and the obtaining of a little normal urine from it led me into the false belief that we had to do with a case of calculous obstruction of the right ureter and reflex anuria of the left kidney. The history of pain in the left side with the muscular spasm and tenderness should have indicated plainly enough that the obstruction was here. Both cases illustrate the fact that

renal drainage is not only a life-saving procedure in these cases but also by allaying ureteral spasm often permits of spontaneous passage of ureteral stones.

Since my experience with these two cases I have become much interested in the subject of calculous anuria and particularly in the matter of reflex anuria.

A number of authorities support the theory of reflex inhibition of one kidney when its fellow is suddenly obstructed as by calculus so-called reflex anuria. They admit, however that such cases are rare.

Watson (2) in his paper before the International Urological Congress in Paris in 1908 cited 11 cases of reflex calculous anuria out of 187 cases collected from the literature and analyzed by him. Watson estimated that in 20 per cent of the cases of calculous anuria there was obstruction of both ureters by calculus. He made a strong plea for simultaneous bilateral operation in appropriate cases. There was a very exhaustive consideration of anuria at this meeting by eminent world authorities. Many additional cases were reported some as evidence of reflex inhibition the majority of reports perhaps favoring the view that such a condition though rare yet really did exist.

Let us consider the evidence upon which the assumption of reflex inhibition rests. In the great majority of cases cited as examples of reflex calculous anuria the unobstructed kidney is the seat of more or less advanced disease. These cases it seems to me should be thrown out, as the term reflex

should not strictly be applied to the failure of such a kidney. Let us take a hypothetical case. A patient has suffered from attacks of renal lithiasis with infection for a number of years and has passed a number of calculi. We know that in such cases the disease is usually unilateral at first with a very strong tendency to become eventually bilateral. We will assume that at the time the patient comes under observation the left kidney has been considerably damaged by repeated attacks of lithiasis, accompanied with infection resulting in a condition of pyelonephritis although at the moment it is entirely clear of stones. The right kidney on the other hand

culoals of lungs since a year ago last October has had five hemorrhages has no cough at present. Patient says he inhaled a loo-ned tooth into his lungs and coughed the tooth up eighteen months later. After raising the tooth there was no further cough or hemoptysis. Habits good. Present illness. When a boy was treated at Boston Emergency Hospital for blood in urine. A trouble from that time until nine months ago when he had pain for two days in the left kidney region. Urine stopped once or twice during this time and finally on the second day of the attack, he passed a stone. Pain has always been on the left side. Last August he had another attack, with vomiting. Passed no urine for a day but finally passed a stone with entire relief.

Sunday night December 1st, five days ago began to have sharp pain in the left side, running down into penis. Has not passed a drop of urine since Monday morning, four days ago appetite failed frequent vomiting.

Examination. Well developed and nourished man rather obese. Nervous and talkative. Mind clear. Breath smells of acetone. Eys little puffy. Skin perty and moist. Mucous membranes pale. Pupils equal, regular, react normally. Teeth poor some pyorrhea. Tongue heavily coated dirty white. Throat not remarkable. Dullness at right lung, lungs otherwise negative. Heart not enlarged, sounds rapid regular. Soft systolic murmur heard best over pulmonary area. Abdomen flat, tympanitic throughout. Tenderness in left costo-vertebral angle and slight tenderness along course of the ureter. Kidney not palpable. Both episthyma thickened. Knee-jerks normal. Rectal examination negative. Temperature normal. Pulse 90. Respiration 20. Immediate X-rays were taken, which showed definite shadow low down in region of right ureter other shadow in region of right kidney, questionable shadow in pelvis of left kidney.

Cystoscopy. Cystoscope passed bladder empty. Filled with boric acid solution. Bladder not remarkable. Both ureteral orifices seen, the right one appearing swollen reddened, and distorted. Unable to catheterize right ureter thought it be partly due to abnormality of orifice and partly to faulty catheter. Left ureteral orifice readily catheterized and catheter passed to kidney pelvis. It is scanty flow of clear urine about ten drops. Catheter fastened in place and patient sent back to ward. The diagnosis at this time as calculous anuria, stone in right ureter reflex anuria of left kidney. The ureteral catheter drained nothing during the night the patient passed it out before morning, but with hypodermic of morphia passed fairly comfort the night. There was no secretion of urine, however. More X-rays were taken in the morning, but without assisting for their development I decided on immediate operation. This was the beginning of the sixth day of complete anuria. The right kidney was exposed by oblique incision in the loin. The kidney was found very small and lobulated,

evidently destroyed by an old tuberculous process, ureter opened and found packed with caseous material. The pedicle of the kidney tied off and kidney removed. Ureter freed as far down as incision allowed and removed, about 15 inches, cigarette drain placed to the stump of the ureter. The incision was then closed, the patient turned on the other side and the left kidney cut down by an oblique loin incision. The kidney was found much enlarged, congested and purple. The edge of retractor accidentally cut into the renal substance this laceration was enlarged and carried down into the pelvis. A stone could be felt by the finger. This wound was packed with gauze and the pelvis of the kidney and ureter freed from the outside. A small stone was distinctly felt in the pelvic outlet. The pelvis was opened but the stone had slipped out of touch. On account of the serious condition of the patient, a protracted search as not made. A incision was passed from the pelvis to the bladder without obstruction. A catheter was fastened into the pelvis of the kidney. The nephrotomy wound was packed with gauze the wound of the parietes was partly closed in layers with catgut. Before the stone was planned, urine commenced flowing from the catheter freely. During the latter part of the operation the condition of the patient caused great anxiety. His color was bad and he stopped breathing several times, requiring artificial respiration. Patient returned to ward in poor condition. Responded to stimulation feebly. There was a free flow of urine from the catheter in the renal pelvis and also into the dressing.

The specimen of the removed kidney contained no more case material also filled the ureter.

The pulse on the day after operation, rose to 160 and the man appeared desperately sick. The heart rate was counted at 95 by Dr D. L. Edsall, he saw the case in consultation, and found acute distention of the heart, 6 cm. to the right, 1 1/2 cm. to the left of midclavicular line. There was some improvement after intravenous injection of atropine. There was marked macular eruption over the entire body. During the next few days there was rapid improvement with very profuse secretion of urine. There was marked desquamation of the skin as the rash faded. In three weeks the wound had nearly closed and all urine was passed by urethra. Nothing had been seen of the stone. A series of very puzzling X-rays, although not conclusive, seemed to show a pretty constant shadow in the pelvis of left kidney. This evidence in conjunction with the sudden reopening of the wound and discharge of urine on the fortieth day decided me to reoperate and search for the stone which I believed still lay somewhere in the pelvis of the kidney.

On January 5, 1913, an incision was made through the old scar. The kidney as freed with some difficulty. Palpation of the ureter and pelvis negative. Rubber-rod and clamp was applied to the pedicle of the kidney and nephrotomy done.

The pelvis was then most thoroughly searched for stone without result a bougie was passed to the bladder without obstruction. A partly broken down lymph-gland lying near the ureter which was at first thought to be a stone, removed. The peritoneal cavity was accidentally opened but immediately closed by suture. The nephrotomy wound was packed, the gauze the clamp removed, and the wound closed with drainage. The operation was started under spinal anesthesia this was satisfactory at first, but the traction necessary to free the kidney caused pain and ether was substituted for it and maintained to the end. There was again considerable shock after operation. The patient made a slow but steady convalescence and was discharged on February 9, 1913 to the Lakeville Sanatorium, in excellent condition with a very small granulating wound in the left side wound in right loin healed.

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These two cases are excellent examples of calculous anuria, and although the operations were in neither case all that might be desired, in that the stones were not found and removed at operation yet the outcome in both was very satisfactory and how the paramount importance and value of drainage as a life-saving measure.

In the first of these cases we have to the best of my knowledge and belief a congenital solitary kidney blocked by a mass of small stones in the ureter with resulting anuria. In the other case we have the active kidney blocked by a stone in the pelvis with complete destruction of it followed by an old tuberculous process.

In this latter case I read the signs and symptoms all wrong. The X ray shadow in the region of the right ureter the impossibility of catheterizing the right ureter together with the ease of catheterizing the left and the obtaining of a little normal urine from it led me into the false belief that we had to do with a case of calculous obstruction of the right ureter and reflex anuria of the left kidney. The history of pain in the left side with the muscular spasm and tenderness would have indicated plainly enough that the obstruction was here. Both cases illustrate the fact that

renal drainage is not only a life-saving procedure in these cases but also by allaying ureteral spasm often permits of spontaneous passage of ureteral stones.

Since my experience with these two cases I have become much interested in the subject of calculous anuria and particularly in the matter of reflex anuria.

A number of authorities support the theory of reflex inhibition of one kidney when its fellow is suddenly obstructed as by calculus so-called reflex anuria. They admit, however that such cases are rare.

Watson (2) in his paper before the International Urological Congress in Paris in 1908 cited 17 cases of reflex calculous anuria out of 187 cases collected from the literature and analyzed by him. Watson estimated that in 70 per cent of the cases of calculous anuria there was obstruction of both ureters by calculus. He made a strong plea for simultaneous bilateral operation in appropriate cases. There was a very exhaustive consideration of anuria at this meeting by eminent world authorities. Many additional cases were reported some as evidence of reflex inhibition the majority of reports perhaps favoring the view that such a condition though rare yet really did exist.

Let us consider the evidence upon which the assumption of reflex inhibition rests. In the great majority of cases cited as examples of reflex calculous anuria the unobstructed kidney is the seat of more or less advanced disease. These cases it seems to me should be thrown out, as the term reflex should not strictly be applied to the failure of such a kidney. Let us state a hypothetical case. A patient has suffered from attacks of renal lithiasis with infection for a number of years and has passed a number of calculi. We know that in such cases the disease is usually unilateral at first with a very strong tendency to become eventually bilateral. We will assume that at the time the patient comes under observation the left kidney has been considerably damaged by repeated attacks of lithiasis accompanied with infection, resulting in a condition of pyelonephritis, although at the moment it is entirely clear of stones. The right kidney on the other hand

has but recently become the habitat of a calculus and but little damage has as yet been done to its parenchyma. It is the active organ of the pair doing three-quarters of the work of elimination for the body. The single small calculus in the right kidney suddenly drops into the renal pelvis and becomes engaged there blocking its outlet and completely obstructing the outflow of urine. Secretion of the right kidney ceases and all the work of urinary elimination of the body falls upon the damaged left kidney. This feeble and diseased organ is unable to respond to the burden suddenly thrown upon it. It is overwhelmed with work and fails to functionate with resulting anuria. Why invoke in such a case the complicated phenomenon of reflex action? Is it not purely a case of functional exhaustion. When the stomach is overloaded with indigestible food the secretory glands rebel at the impossible task, digestion ceases and the overload is thrown off by vomiting. An overloaded kidney cannot relieve itself by vomiting and if its function is already handicapped by disease it is soon forced to a point beyond which it cannot go. Function ceases, with resulting suppression. The suppression of function of a single diseased kidney or of two such for that matter as the result of an overwhelming burden being cast upon it or them will of course be readily granted by the advocates of reflex inhibition. But they will object that renal failure of such a nature is accompanied or preceded by all the well known symptoms and signs of uræmia while in these cases of calculous anuria there is a striking lack of any such signs for from three to six days after the anuria has become complete the so-called period of tolerance. This is undoubtedly true in the vast majority of cases which is generally conceded to consist of those in which the entire functioning renal substance has been suddenly put out of commission by calculous obstruction of the only active kidney or of both kidneys. It is a striking fact however that in the few cases of anuria recorded in which the second kidney was found unobstructed but diseased uræmic symptom supervened early. Cases of Mareille and Leonté (3)

If a structure is supported on two pillars, and one of these the stronger of the two is suddenly knocked away so that the whole weight is thrown on the remaining weaker one whose strength is unequal to the burden, its collapse is not spoken of as a reflex act.

Fortunately for the human economy either kidney alone is amply capable of carrying on the normal work of elimination for the body if sound or nearly sound. At just what degree of unsoundness of a single kidney renal failure ensues it is impossible to determine many complex factors entering into the problem.

It seems to me that the term reflex should be applied only to such cases as those in which the supposedly inhibited organ is organically sound. If one accepts this proposition, the problem is simplified and the number of cases becomes considerably diminished. Watson's seventeen cases for example are immediately reduced to seven, and careful scrutiny of these raises the question whether other interpretations than reflex action are not applicable.

Donnadieu (4) in 1895 analyzed forty-six cases of calculous anuria with the following results. In six cases there was absence of the second kidney. In thirteen cases the obstruction was double. In twenty-three cases the function of the second kidney was suppressed as the result of traumatism. In one cystic degeneration. In one lithiasis. In twenty-one leaving four cases in which he considered the suppression of the second kidney as due to reflex action. In these four cases he admits there may have been some lesion present in the inhibited organ.

Huck collected in 1904 sixty-one cases from the literature which had appeared since Donnadieu's work. Of these thirty offered sufficiently explicit data for analysis. He found thirteen cases of bilateral obstruction of the ureters, four cases of obstruction of one ureter, the other kidney being completely atrophied, three cases of obstruction of one ureter, the other kidney being congenitally but not the cause of obstruction of one ureter, the other kidney having been nephrectomized, and three cases of obstruction of one ureter, the other kidney presenting no

obstruction verified at autopsy. These are cases of Marclille Leonté and Albaran. In two of these latter cases there was diffuse nephritis of the unobstructed kidney. This leaves but one case out of thirty in which there is question of reflex inhibition of a sound kidney. And in this case exact histological data as to the condition of the unobstructed kidney are lacking. It is merely stated that it was enlarged and congested.

In fact as far as I have been able to learn, no cases have been reported of so-called reflex calculous anuria backed by convincing post mortem and histological evidence of the soundness of the unobstructed kidney. This is an essential desideratum for acceptance of the theory.

As Legueu (5) points out, kidneys which appear macroscopically normal may be totally degenerated and even a slight proliferation may suffice to definitely compromise their function.

Let us consider next the purely clinical evidence some of which seems at first glance to be quite strong. These cases divide themselves into two groups—those in which evidence of the return of function of the unobstructed but inhibited organ is gained by the use of the ureteral catheter and the flow of normal urine and those in which, after a nephrotomy with drainage of bloody urine from the wound, the passage of large amounts of clear urine from the bladder is looked upon as of like import.

These cases are of course very suggestive especially when backed by corresponding X-ray evidence. A few of them have been yet they are suggestive of other interpretations. In the first place the obtaining of normal urine is not conclusive that the kidney from which it issues is normal. The kidney may be congenitally small of infantile type, atrophied and incapable of carrying on alone the work of elimination for the body and yet secrete small amount of normal urine. Again many cases of considerable degrees of interstitial nephritis are undetectable from urinary analysis. Furthermore the ureteral catheter may fill a stone and obtain practically normal urine and undisturbedly happen in many cases

A frequent source of error is ureteral spasm provoked by a small calculus. The ureteral spasm yields to narcosis and allows urine to pass although the stone still remains in the ureter. Three instructive cases of this kind are cited by Huck, two reported by Bruch and one by Weiss in which urine was voided naturally after unilateral nephrotomy for calculous anuria and yet double ureteral obstruction by calculus was proved later at autopsy. A calculus acting as a ball valve might also be mistaken for reflex inhibition. Ureteral spasm practically always accompanies the passage of a stone down the ureter and is the cause of the accompanying renal colic. It is associated with anuria of the corresponding kidney probably in most cases. I had occasion recently to observe it in a case of right ureteral fistula, in which a stone became engaged in the opposite ureter with entire cessation of entrance of urine into the bladder for thirty six hours. The vagaries of renal colic are well known. A stone may be impacted in the ureter tightly without colic and without anuria. Ureteral spasm may relax at any moment and allow the passage of the stone or allow the passage of urine the stone remaining in the ureter.

A case is recorded of a patient with anuria falling out of bed while writhing in the agony of renal colic followed by immediate cessation of pain and resumption of normal urinary secretion.

Under these circumstances the cases of Israel (6) Kreps (7) Imbert (8) Rossing (9) and others in which the reestablishment of urinary secretion in the supposedly unobstructed but inhibited kidney was shown by ureteral catheterization although very suggestive cannot be considered as wholly convincing. The same applies to the case of Johnson (10) and other of like nature.

Legueu maintains that inhibition does not enter into the problem of calculous anuria at all that it is not inhibition that arrests secretion of the obstructed kidney but increased tension for once the kidney is opened although the calculus remain untouched secretion is resumed. It is the letting up of renal tension which allows the kidney to resume function.

Experimental evidence of the renorenal reflex inhibition due to obstruction of a ureter is scanty. Gatz (11) whose work has been extensively quoted by advocates of the reflex theory was able to produce temporary anuria in three out of twelve experiments on dogs by obstruction of a single ureter. His results, however are vitiated to a certain extent by the fact that the dogs used were narcotized by large doses of morphine, so that there was a toxic element present. I cannot find that his experiments have been substantiated by others. Dr J. D. Barney of Boston has done considerable experimental work on the ligature of the ureter in animals. He reports thirty-three cases of unilateral ligation of the ureter—seven in rabbits and twenty-six in dogs—without the occurrence of anuria in a single case. He noted a temporary diminution of the urine secreted from the unobstructed side for a day or two followed by a compensatory hypersecretion later. He found varying degrees of hydronephrosis in the obstructed kidney in all cases indicating a rise of intrarenal pressure. Barney also collected sixty-two authentic cases of sudden and complete occlusion of the ureter by ligature or clamp in the course of operations on human beings. Of these sixty-two cases the ureteral injury was unilateral in forty-six and bilateral in sixteen, the large majority occurring in the course of a hysterectomy vaginal or abdominal. Anuria occurred in all the bilateral cases as was to be expected. In the forty-six unilateral cases anuria occurred but once the patient dying after thirty-six hours of acute uremia. Data as to the condition of the other kidney in this case are entirely lacking.

In summing up, then, the subject of reflex calculous anuria it can fairly be stated that while the possibility of reflex inhibition of a sound unobstructed kidney cannot be absolutely denied, convincing post-mortem clinical, and experimental proof is still lacking.

It seems unreasonable to ascribe to the mysterious and little understood phenomenon of reflex inhibition the failure of an unsound but unobstructed kidney to secrete, when its more active fellow is suddenly obstructed by calculus, when the simpler phenomenon

of functional failure under overload is adequate explanation.

For all practical purposes, then calculous anuria should be considered a purely mechanical problem and treated as such. The diagnosis having been made, it should be assumed that either only one actively functioning organ exists, which is blocked, or that there is blocking of both kidneys. The indication is to unblock at the earliest possible moment. The diagnosis is usually self-evident and needs but little consideration. The X-ray and cystoscope are of the greatest aid in locating the sites of obstruction and indicating the point of attack. The cystoscope and ureteral catheter have of late years been likewise of therapeutic value in many cases. When the condition of the patient is not alarming it is undoubtedly wise as a preliminary measure to attempt the dislodging of a ureteral stone, or at least the allaying of ureteral spasm by this means, and it will occasionally suffice in itself to obtain a cure. In desperate cases at once, and in all other cases when the ureteral catheter fails to give permanent relief operative measures must be resorted to.

The ideal procedure is not only to relieve the tension of the obstructed kidney but to remove the obstruction as well, and this can often be done when the stone is readily accessible at the outlet of the kidney pelvis. When the stone is impacted in the lower end of the ureter it will seldom be wise to undertake its removal during anuria. It is safer to be content with simple drainage of the kidney which will often result by relief of intrarenal pressure, and the allaying of ureteral spasm, in spontaneous passage of the stone. If not, it can be removed later.

Nephrotomy is generally advocated as the method of choice because it is quickly and easily done, secures good drainage and permits of removal of any stone found in the pelvis of the kidney. It has but one disadvantage, which to me is a very serious one, the danger of hemorrhage. Pyelotomy is certainly safer gives equally good drainage, and amputates any occluding stone of moderate size. When the kidney is very much enlarged it might be found to be some-

what more difficult. I should personally attempt it in another case. If upon cutting down upon one kidney it is found to be functionally useless or even considerably damaged the other kidney should be immediately explored in the hope of releasing what ever functioning renal substance may be imprisoned there. The simultaneous bilateral operation has been ardently advocated by Watson and deserves recognition in appropriate cases. If bilateral obstruction is found to occur in twenty per cent of all cases this fact would seem to afford a substantial basis for the operation.

In the few cases of anuria recorded in which one kidney was obstructed and the other diseased but apparently unobstructed incision and drainage of the unobstructed organ has afforded little or no relief. This is in accord with the disappointing results obtained from nephrotomy in urinary suppression due to causes other than stone such as nephritis, corrosive sublimate poisoning, etc.

In conclusion I wish to lay emphasis on the following points:

1. Analysis of cases of calculous anuria recorded in the literature show that at least in ninety per cent either only one actively functioning organ existed which was blocked or that there was blocking of both kidneys.

2. The few cases reported as examples of reflex inhibition of an unobstructed but more or less diseased kidney, the result of calculous obstruction of it, likewise are to be explained more rationally as the functional failure of an overloaded unsound organ.

3. Convincing post-mortem and histological evidence of reflex inhibition of sound

kidney as the result of calculous obstruction of its fellow is lacking.

4. Convincing clinical and experimental evidence is likewise lacking.

5. From a practical point of view then calculous anuria should be considered and treated as a purely mechanical problem.

6. The therapeutic employment of the ureteral catheter should be restricted to a tentative use in mild cases only.

7. Operation should be resorted to at once in all urgent cases, the indication being to relieve obstruction, pyelotomy when practicable to be preferred to nephrotomy. Removal of the stone is an ideal to be attained whenever possible without undue prolongation of the operation.

8. Bilateral operation is indicated whenever the kidney first cut down upon seems inadequate by itself to sustain the work of elimination of the body. It naturally follows from this that the bilateral operation should be performed whenever the kidney first cut down upon is apparently found unobstructed.

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BRIEF ER. DR. JOL. New York, N. Y. (Continued)

No.	ER. DR. JOL. New York, N. Y. (Continued)			Condition and Treatment of Tube	Condition and Treatment of Ovary	Admission Date	Previous Condition	CURRIER, DR. ANDREW F. New York, N. Y.			Remarks
	1	2	3					4	5	6	
35	101	101	101	Normal, not removed	Normal, not removed	101	Good	101	101	101	Admission date, 101
36	102	102	102	Normal, not removed	Normal, not removed	102	Good	102	102	102	Admission date, 102
37	103	103	103	Normal, not removed	Normal, not removed	103	Good	103	103	103	Admission date, 103
38	104	104	104	Normal, not removed	Normal, not removed	104	Good	104	104	104	Admission date, 104
39	105	105	105	Normal, not removed	Normal, not removed	105	Good	105	105	105	Admission date, 105
40	106	106	106	Normal, not removed	Normal, not removed	106	Good	106	106	106	Admission date, 106
41	107	107	107	Normal, not removed	Normal, not removed	107	Good	107	107	107	Admission date, 107
42	108	108	108	Normal, not removed	Normal, not removed	108	Good	108	108	108	Admission date, 108
43	109	109	109	Normal, not removed	Normal, not removed	109	Good	109	109	109	Admission date, 109
44	110	110	110	Normal, not removed	Normal, not removed	110	Good	110	110	110	Admission date, 110
45	111	111	111	Normal, not removed	Normal, not removed	111	Good	111	111	111	Admission date, 111
46	112	112	112	Normal, not removed	Normal, not removed	112	Good	112	112	112	Admission date, 112
47	113	113	113	Normal, not removed	Normal, not removed	113	Good	113	113	113	Admission date, 113
48	114	114	114	Normal, not removed	Normal, not removed	114	Good	114	114	114	Admission date, 114
49	115	115	115	Normal, not removed	Normal, not removed	115	Good	115	115	115	Admission date, 115
50	116	116	116	Normal, not removed	Normal, not removed	116	Good	116	116	116	Admission date, 116
51	117	117	117	Normal, not removed	Normal, not removed	117	Good	117	117	117	Admission date, 117
52	118	118	118	Normal, not removed	Normal, not removed	118	Good	118	118	118	Admission date, 118
53	119	119	119	Normal, not removed	Normal, not removed	119	Good	119	119	119	Admission date, 119
54	120	120	120	Normal, not removed	Normal, not removed	120	Good	120	120	120	Admission date, 120
55	121	121	121	Normal, not removed	Normal, not removed	121	Good	121	121	121	Admission date, 121
56	122	122	122	Normal, not removed	Normal, not removed	122	Good	122	122	122	Admission date, 122
57	123	123	123	Normal, not removed	Normal, not removed	123	Good	123	123	123	Admission date, 123
58	124	124	124	Normal, not removed	Normal, not removed	124	Good	124	124	124	Admission date, 124
59	125	125	125	Normal, not removed	Normal, not removed	125	Good	125	125	125	Admission date, 125
60	126	126	126	Normal, not removed	Normal, not removed	126	Good	126	126	126	Admission date, 126
61	127	127	127	Normal, not removed	Normal, not removed	127	Good	127	127	127	Admission date, 127
62	128	128	128	Normal, not removed	Normal, not removed	128	Good	128	128	128	Admission date, 128
63	129	129	129	Normal, not removed	Normal, not removed	129	Good	129	129	129	Admission date, 129
64	130	130	130	Normal, not removed	Normal, not removed	130	Good	130	130	130	Admission date, 130
65	131	131	131	Normal, not removed	Normal, not removed	131	Good	131	131	131	Admission date, 131
66	132	132	132	Normal, not removed	Normal, not removed	132	Good	132	132	132	Admission date, 132
67	133	133	133	Normal, not removed	Normal, not removed	133	Good	133	133	133	Admission date, 133
68	134	134	134	Normal, not removed	Normal, not removed	134	Good	134	134	134	Admission date, 134
69	135	135	135	Normal, not removed	Normal, not removed	135	Good	135	135	135	Admission date, 135
70	136	136	136	Normal, not removed	Normal, not removed	136	Good	136	136	136	Admission date, 136
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77	143	143	143	Normal, not removed	Normal, not removed	143	Good	143	143	143	Admission date, 143
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79	145	145	145	Normal, not removed	Normal, not removed	145	Good	145	145	145	Admission date, 145
80	146	146	146	Normal, not removed	Normal, not removed	146	Good	146	146	146	Admission date, 146
81	147	147	147	Normal, not removed	Normal, not removed	147	Good	147	147	147	Admission date, 147
82	148	148	148	Normal, not removed	Normal, not removed	148	Good	148	148	148	Admission date, 148
83	149	149	149	Normal, not removed	Normal, not removed	149	Good	149	149	149	Admission date, 149
84	150	150	150	Normal, not removed	Normal, not removed	150	Good	150	150	150	Admission date, 150
85	151	151	151	Normal, not removed	Normal, not removed	151	Good	151	151	151	Admission date, 151
86	152	152	152	Normal, not removed	Normal, not removed	152	Good	152	152	152	Admission date, 152
87	153	153	153	Normal, not removed	Normal, not removed	153	Good	153	153	153	Admission date, 153
88	154	154	154	Normal, not removed	Normal, not removed	154	Good	154	154	154	Admission date, 154
89	155	155	155	Normal, not removed	Normal, not removed	155	Good	155	155	155	Admission date, 155
90	156	156	156	Normal, not removed	Normal, not removed	156	Good	156	156	156	Admission date, 156
91	157	157	157	Normal, not removed	Normal, not removed	157	Good	157	157	157	Admission date, 157
92	158	158	158	Normal, not removed	Normal, not removed	158	Good	158	158	158	Admission date, 158
93	159	159	159	Normal, not removed	Normal, not removed	159	Good	159	159	159	Admission date, 159
94	160	160	160	Normal, not removed	Normal, not removed	160	Good	160	160	160	Admission date, 160
95	161	161	161	Normal, not removed	Normal, not removed	161	Good	161	161	161	Admission date, 161
96	162	162	162	Normal, not removed	Normal, not removed	162	Good	162	162	162	Admission date, 162
97	163	163	163	Normal, not removed	Normal, not removed	163	Good	163	163	163	Admission date, 163
98	164	164	164	Normal, not removed	Normal, not removed	164	Good	164	164	164	Admission date, 164
99	165	165	165	Normal, not removed	Normal, not removed	165	Good	165	165	165	Admission date, 165
100	166	166	166	Normal, not removed	Normal, not removed	166	Good	166	166	166	Admission date, 166

NEWELL, DR. FRANKLIN B. Boston, Mass. (Dental)

Sl. No.	Dr.	Q. No.	Q. Title	Condition and Response to Treatment	Condition and Response to Treatment	Condition and Response to Treatment	Condition and Response to Treatment	Condition and Response to Treatment	Condition and Response to Treatment
110	100	22	1	0	Approximately normal	Approximately normal	Approximately normal	Approximately normal	Approximately normal
111	101	23	1	0	Approximately normal	Approximately normal	Approximately normal	Approximately normal	Approximately normal

MONTGOMERY DR. L. L., Philadelphia, PA

110	78	5	?	Kernal, not removed	Has lamp by date 21/11/77 (not removed)	0	Good
11	73	53	?	Not stated	Has pad only removed	0	Good

[illegible]

18	06	1	7	Normal, not removed	Returned empty	0	All insects seen prior to operation in past 24 hrs no operation
113	06	6	7	Normal, not removed	Returned empty	0	Good
4	07	2	7	Cowd. not removed not removed	Cowd. not removed by manipulation	0	Cowd. health
Operational appendages and behavior							
113	08	2	7	Not removed tube removed	Tube removed and returned	0	No indication of operation
16	08	23		Probed in situ	Returned	0	No indication of operation
17	04	23	7	Probed by in situ	Returned, in situ		No indication of operation
113	08	26	7	Probed and returned, in situ	Returned and returned, in situ		Cowd. health

PERFUSION, DR. KLEINER, AND ARTHUR MARK.

[illegible]

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Sl. No.	Dr.	Q. No.	Q. Title	Condition and Response to Treatment	Condition and Response to Treatment	Condition and Response to Treatment	Condition and Response to Treatment	Condition and Response to Treatment	Condition and Response to Treatment
110	100	22	1	0	Approximately normal	Approximately normal	Approximately normal	Approximately normal	Approximately normal
111	101	23	1	0	Approximately normal	Approximately normal	Approximately normal	Approximately normal	Approximately normal

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110	78	5	?	Kernal, not removed	Has lamp by date 21/11/77 (not removed)	0	Good
11	73	53	?	Not stated	Has pad only removed	0	Good

[illegible]

18	06	1	7	Normal, not removed	Returned empty	0	All insects seen prior to operation in past 24 hrs no operation
113	06	6	7	Normal, not removed	Returned empty	0	Good
4	07	2	7	Cowd. not removed not removed	Cowd. not removed by manipulation	0	Cowd. health
Operational appendages and behavior							
113	08	2	7	Not removed tube removed	Tube removed and returned	0	No indication of operation
16	08	23		Probed in situ	Returned	0	No indication of operation
17	04	23	7	Probed by in situ	Returned, in situ		No indication of operation
113	08	26	7	Probed and returned, in situ	Returned and returned, in situ		Cowd. health

PERFUSION, DR. KLEINER, AND ARTHUR MARK.

[illegible]

AMTIL Det. EDWARD B. GORDON, 3414 17th Avenue N.W., Wash., D.C. 20010-4400

Case No.	Age	Sex	Length of Illness	Condition and Treatment on Admission	Complication and Treatment	Admission Date	Discharge Date	Final Condition
22	46	Male	31	1	Old abscess removed, abscess drained, abscess removed, abscess removed	0	0	Good
7	50	Male	21	0	Normal and removed	0	11	Some pain from abscess, but otherwise well
8	50	Male	22	7	Abscess large abscess, abscess removed, abscess removed, abscess removed	0	0	Good
9	52	Male	2	1	Normal, abscess removed	0	0	Good

STEVENS, DR. EDMUND H. North Cambridge Mass.

	0	1	2	3	4	5	6	Good
Normal not removed								
Removed, not used								
Normal not removed								
Removed, not used								

FROM THE UNITED STATES GOVERNMENT

[illegible]

SMITH, DR. RICHARD N., Grand Rapids, Mich.

[illegible]

Three have at present induration or masses in the pelvis and more or less pelvic symptoms, but no operation advised (Anspech Newell and Tausig.)

One had pelvic inflammatory condition from remaining tube. (Manwarring.)

One has uterine prolapse. (Brettaner.)

One has fibroid, now inflamed following recent childbirth—three children since ectopic. (Brettaner.)

One had fluxus following operation operated four years later—removal of remaining tube and repair of ventral hernia. (Barrett.)

One in which there was a question as to whether patient did or did not have a repeated ectopic fifteen months after the first operation. Patient was operated per vaginam and a pus collection on the opposite side evacuated. This had developed after acute symptoms and one week after a missed period. (Miller.)

One died seven years after operation of unknown cause—health until then good. (Stevens.)

Those who had a second ectopic will be discussed later. No effort was made to obtain the immediate mortality from operation and where such reports were sent me they were excluded from the list.

The final results from operation, excluding the cases of repetition to be mentioned were it appears very satisfactory. But very few of these patients have suffered any serious inconvenience in subsequent years from their ectopic pregnancy or operation, and a large number doubtless owe their lives to the intervention.

As suggested at the beginning of this paper there are two things in the future course of these patients which interest us most of all, more so since we commonly have them directly within our control at the time of operation—one the question of further normal pregnancy and the other that of repetition of a tubal one. If the opposite tube is hopelessly closed and the condition of our patient permits, the general rule is to remove it (and perhaps other diseased organs) and few would seriously question this procedure. A very large percentage of our ectopic cases remain sterile following operation (In this list, 97 out of 144 in which pregnancy might conceivably

occur). How much the repair processes that follow the extravasation of often large quantities of blood especially when long retained, may have to do with this is a question. As a rule, however these conditions are much less persistent than follow a pelvic infection involving the same structures. Even after most extensive extravasations, pregnancy not infrequently takes place so that we may well afford to deal conservatively with the remaining tube if further pregnancy is desirable and the tube itself in good condition. It is usually considered advisable to gently separate the adhesions about these tubes when such are present. Engström has done this in six cases resulting in normal pregnancy and Prochownik has seen the same results four times in his series.

Although salpingostomy and other plastic operations have not yielded very encouraging results, they might perhaps be tried.

But what if we leave a normal, patulous tube or one that we are capable of releasing and perhaps making so? Knowing that the same accident may occur in such a tube that is left, our only reason for leaving it the patient's condition permitting, is that it will make possible a normal uterine pregnancy. What does the future of this class show in our series of cases? There are here 192 cases traced for a period of five years or more. Of these, forty-eight had operations of a nature to preclude further pregnancies, or had already had the other tube removed.

12 had hysterectomies

31 opposite tube removed

3 opposite tube had previously been removed.

1 distal end removed for hydrosalpinx making pregnancy very improbable.

1 tube ligated but not removed.

In this list no opposite tubes were according to our records, removed except for disease. These cases must, of course be completely excluded from consideration in estimating further pregnancies. There is no justification for including them.

In these cases in which the record of the condition and disposal of the opposite tube was not complete, we have presumed that no additional conditions that pregnancy was possible. Eight of these were vaginal sections.

The inquiry into the civil condition of the patient after operation would seem to indicate that this factor in the occurrence of subsequent pregnancy should not be taken seriously into account.

This leaves 144 in which a pregnancy was conceivably possible. Forty seven of these women have had uterine pregnancies or 32.6+ per cent (forty two with living children sixty four children in all one stillborn five aborting without children five had abortions and children) ninety-seven had none. There were twenty-one cases of repeated ectopic pregnancy half as many as had living children. Two women had subsequent children and a repeated ectopic. Of the sixty seven women under thirty years of age twenty-seven had subsequent uterine pregnancies ten had a repeated ectopic pregnancy. Of the seventy-four women above thirty nineteen had subsequent uterine pregnancy and eleven had a repeated ectopic. In three cases age (not given, but tube retained) one of these had a subsequent pregnancy.

If then, much less than half of our ectopic cases have children subsequently (Easen Moller 46 per cent Prochownik 43.8 per cent our figures 32.6 per cent) and 14.6 per cent repeat their ectopic leaving out the few women who have had further inflammatory trouble with the opposite tube is it best to always save the opposite tube when it seems capable of transmitting the ovum. Each man must answer this question for himself according to his convictions on the matter of preserving the childbearing function and the seriousness that he attaches to a further ectopic pregnancy. He will according to his habit defer little or much to the wishes of the patient in the matter but whatever his

action it should be determined after serious consideration of these facts. In young women the desirability of preserving the childbearing function is of greatest importance. In time and with the advent of children, this desirability ordinarily diminishes. In the beginning it overrules all but the most serious considerations and would lead us always to conservation later other less serious considerations (mainly the possibility of a second ectopic pregnancy) must be taken into account.

In other pelvic lesions we ordinarily maintain a most conservative attitude in our younger patients — later we do not hesitate to remove the possibility of children if the preservation of the necessary organs threatens to implicate her health. Why should we not do the same with our ectopic cases? Would we not best serve her interests by removing the possibility of a repetition of this distressing accident when the need of children is no longer so urgent? With these patients, as with all others in whom an operation which may involve the childbearing function is considered, I believe we should discuss the matter freely with her and be governed to a certain though limited extent by her wishes. Not the favorable appearance of a tube but the future history of such recorded cases should be the basis for our judgment. Her age, the number of children she has borne her general health and her wishes as to further pregnancies should all enter into this consideration. If she then has another tubal pregnancy we shall at least have a good excuse for having deliberately submitted her to its serious possibilities. Personally I am now removing the opposite tube in those women in whom, for reasons suggested above childbearing is no longer desirable — in others I preserve it.

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and sarcoma is prone to occur in strong and healthy individuals, and more often in the young than in the middle aged and old.

Syphilis This is a rare condition in the clavicle, so where no other bone is involved where the clinical diagnosis is reasonably indicative of sarcoma especially where the tumor has appeared in a young person showing rapid growth excision should be done without excising a portion of the tumor for microscopical examination thereby giving the opportunity for localized infection. It is usually impossible to make a satisfactory frozen section for the reason that decalcification must first be made. We would advise total extirpation as partial extirpation of any bone for sarcoma is incomplete surgery. Coley Richardson and others advise treatment with the mixed toxins of erysipela and bacillus prodigiosus as a prophylactic against recurrence. Coley claims that it is entirely free from danger and this has been my observation but frankness compels me to state that my results from its use in sarcoma in other bones have been disappointing. Bearing in mind however the statements of Coley that it is without danger and that in cases of sarcoma of the long bones generally in which toxins have been used recurrences have been less than one third as frequent as in cases in which they have not been used justification for its use in all cases would seem apparent.

Results after excision In two cases there was recurrence in four years after operation in two within eighteen months in one case sarcoma of the femur developed three months after operation. In one case there was local recurrence within six months in one recurrence was immediate. In sarcoma occurred in the upper jaw nine months after operation in three cases recurrence was within three months in seven recurrence occurred within six months, two were well five years after operation one case well one year one case well seven months one case eight years and the case reported below well six months after operation.

A B age seven years, mother hit the head by violence so family history of tuberculosis or syphilis. Patient fairly well developed boy, no

Hutchinson teeth or other evidence of congenital syphilis. Tumor of clavicle was noticed eight months before he presented himself. At five months he was seen by another person who cut down on the tumor chiseled it away as best he could, and submitted the specimen to Dr. Wm. Litterer who reported giant-cell osteosarcoma. The wound healed but the tumor rapidly reproduced itself and when he presented himself on July 23 1913 the tumor the size of an English walnut was attached to the inner third of the clavicle and first rib. It was hard smooth, and firmly attached at its base with no history of trauma.

The diagnosis of malignancy having already been made we advised its immediate removal. A T-shaped incision was made from the sternum along the inner border of the clavicle to the coracoid process of the scapula and from the upper portion of the sternum to the upper border of the second rib. The skin over the tumor was removed by an elliptical incision, and realizing the danger of division of the clavicle disarticulation was made from the sternum at the first rib the cervical fascia and sterno-mastoid muscle incised well above the tumor until the middle portion of the clavicle was reached here the trapezius muscle was separated from its acromioclavicular attachment close to the bone. The same method was used below. The clavicle lifted from its sternal end and separated from the mediastinum the pleura, the subclavian vessels and ligaments by gauze and scissor dissection. The rib was disarticulated from the sternum separating it from the scalenus medius and intercostal muscles, the mediastinum and the pleura by blunt dissection the close proximity of the subclavian vessels passing through the subclavian grooves of the first rib as the most tedious part of the procedure. A small abdominal retractor was padded with gauze and the chest held up by assistants during the removal of the outer part of the rib. The dissection completed the vertebral attachment some difficulty was encountered disarticulation finally this was accomplished by meeting blunt scissors into the articulation and severing the ligament. The tumor was sufficiently loose to the sternum for me to indulge in the fear that this bone had become affected. Consequently removed about one-half of the sternum from its upper part to the upper portion of the second rib. The safety of this procedure was I think guaranteed by the separation of the mediastinum from the posterior surface of the sternum and its protection by gauze. I can conceive no more important step in this operation than the protection of the pleura and mediastinum from infection, as a large percentage of immediate fatalities have been caused by infection of these cavities. The wound closed by approximating the cervical fascia, the sterno-mastoid and the trapezius muscles above and the deltoid and fibers of the pectoralis major muscles below. The skin closed and approximation of the internal half of skin secured by a flap from below.

EXCISION OF THE CLAVICLE AND FIRST RIB FOR MALIGNANT DISEASE

BY R. E. FORT, M. D., NASHVILLE, TENNESSEE

MUCH doubt exists as to whom credit should be given for the honor of first completely excising the clavicle.

Treves (1) gives McCreary of Kentucky priority 1811. Gross (2) credits Remmer as the first operator in 1732. Zabel (3) credits Moreau and D. Angerville of Paris with the first total excision in 1765 and claims that the operation of Remmer was without doubt, a partial, not a total, extirpation. Heyfelder (4) gives Meyer the credit of the first in 1823 and Cassebohn with the first partial extirpation in 1719 and Coley (5) credits Valentine Mott with the first in 1828.

Without attempting to harmonize this conflict of authorities as to who is entitled to this honor we were astonished to find reports of only sixty-four total excisions, one of excision of the clavicle and distal ends of the first and second ribs. "Morritt's Case" reported by Carson (6) and no reported cases of total excision of the clavicle and the first rib.

It is the writer's object to report a case of excision of the clavicle and first rib but it will not be amiss to notice some of the important facts concerned in the literature of excision of the clavicle. Mott in his report says: "This operation far surpasses in tediousness, difficulty and danger anything that I have ever witnessed or performed. It is impossible for any description which we are capable of giving to convey an accurate idea of its formidable nature." Velpeau (7) calls the operation "a daring attempt never carried into effect except in a few cases of operation upon the shoulder." Yet he says: "There are circumstances sufficiently numerous which require this operation if we wish not to abandon the sufferers to certain death." C. Norke (8) collected thirty-two cases of excision for malignant tumors, of which twenty-four were sarcoma, five reported as carcinoma, two exosthosis, and one chondroma with six deaths. Coley states that the cases reported as carcinoma were prob-

ly sarcoma, as primary carcinoma of the clavicle is unknown.

Since 1893 Coley has collected thirty-two additional cases making a total of sixty-four.

The immediate mortality of excision of the clavicle is between sixteen and eighteen per cent, but the end results, or those who die from recurrence, is quite seventy per cent. The results, however, are sufficiently hopeful to make immediate surgical intervention not only justifiable but mandatory.

The types of tumors observed by pathologists have been varied,—periosteal round cell periosteal, spindle-cell osteosarcoma, small round-cell, spindle-cell myeloid round cell myelogenous, chondroma embryonic, myeloid myeloid fibrous and fibro-plastic, and my own osteosarcoma giant-cell.

Age of patients. Two between one and ten years, twenty between ten and twenty-nine, nine between twenty and thirty, twelve between thirty and forty, seven between forty and fifty, one between fifty and sixty and three between sixty and seventy.

Diagnosis. A study of the reported cases makes it quite clear that the diagnosis must be made early if there is to be a probability of saving the patient. No variety of tumor is more malignant than a majority of sarcomata of the clavicle. The vascularity of the neck insures early infiltration and rapid generalization. The history of antecedent trauma is important. Seven of the nine cases observed by Coley gave histories of trauma. In most cases the swelling will be noted very soon after the receipt of the injury. In its early stages, it is usually hard, smooth, and immovable.

Tuberculosis. Tuberculosis is a condition from which sarcoma must be differentiated.

A history of tuberculosis in the family or tuberculosis in some other portion of the body would justify a search for sarcoma (Coley). It is also to be noted that primary tuberculosis of the clavicle is extremely rare.

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B. FRID H. ALBEE, A. B. M. D. F. A. C. S., New York City

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THIS report of original surgical uses of the bone graft is a supplement to the following communications which appeared in the Folder of the American Orthopedic Association, May 15 1911; Journal of the American Medical Association September 9 1911 and August 3 1912 p. 353 The Post Graduate, November 1912, xxvii No 11 Author's Stereo-Clinic, published by Southworth Co American Journal of Surgery January 1914 and Zeitschrift f Orthopädische Chirurgie xxxi.

This paper is based upon an experience gained from 253 human bone-graft cases over a period of three years, also a large amount of animal experimentation devoted to the study both macroscopic and microscopic of the bone graft when used in ways similar to the technique employed in the human cases.

The following technique of applications of the bone graft involves the author's original usage so far as the writer is informed with the exception of three incidences.

These cases have been operated in the past three years, and include 178 cases of Pott disease sixteen wedge-graft corrections in case of congenital club-foot seventeen iliac grafts for ununited fractures of the long bones fourteen cases of paralytic foot deformities the remaining twenty-eight cases include bone-graftings for fixation of tubercular ankle repair of osteomyelitic cavities transplanting astragalus for absent head and neck of femur the correction of paralytic drop-wrist, deformity of the tibia following fracture, underdevelopment of the jaw fixation of tubercular knee reinforcing the bony deficiency and muscular weakness in spina bifida in conjunction with arthroplasty for paralytic dislocation of the hip congenital dislocation of the hip paralytic scoliosis restoring depressed nasal bridge, fixation of tubercular sacro-iliac joint ununited fracture

of the spine ununited fracture of the femoral neck congenital absence of tibia replacing bone deficiency following removal of osteosarcoma, mobilizing ankylosed hips and carpus by the use of osteocartilaginous grafts.

Enough time has not elapsed in some of the later cases to be able to draw trustworthy conclusions as to their ultimate results. But as our early cases have proved the permanency of the graft and result up to three years, and as other observers have followed bone graft cases even as long as thirty years, we believe that the reliability and permanency of the bone graft has been sufficiently proven.

We agree, also with McWilliams that the periosteum on the graft plays an important rôle in aiding to establish a more abundant and earlier blood supply or nutrition to the graft as I have previously stated.

The endosteum and the marrow substance also serve a similar purpose to the periosteum either acting as a ready medium through which the bone transplant gets its nutrition or in case the bone-cells in the graft die, furnishing living active cells through which the graft is regenerated.

The membranes covering cortical bone act largely as the physiological media through which these cortical cells naturally get their nutrition again, their loose structure is very favorable to taking up nourishment or establishing vascular means to that end with the environment in which they are placed. Therefore the wisdom of including these structures on all grafts is obvious. Attention should also be called to the fact that the bone graft stimulates an active osteogenesis on the part of the recipient bone itself therefore contributing further in this way toward the assurance of permanency of result.

The execution of the technique involved in the application of the bone-graft in many

J. Am. M. Ass., 1913, April 21st.

Read before the Congress of German Surgeons, April 12th, 1913, Berlin, Germany.

A cigaret drain was inserted at the middle portion of the wound, no vessel was tied throughout the operation. Time of operation one hour and forty-five minutes. There was no injury to either the mediastinum or the pleura, consequently there was no infection.

The patient set up on the fourth day, and made an uninterrupted recovery, leaving the hospital on August 8th, having gained ten pounds in weight. After ten days the use of the left arm was encouraged. The two features which impressed us most were the free use of the arm, and the absence of deformity of the left chest. In the absence of the scar it would be hard to detect the side upon which the excisions had been done. Toxins of erysipelas and bacillus prodigiosus were given in increasing doses until the dose was established, and this dose was persisted in for two months after operation.

A letter received from his uncle, Dr. J. D. Bryant of Fayetteville, Tennessee, dated December 3d, reports that he is going to school, growing, and has no evidence of recurrence. He also reports that he shucks corn, harnesses the horses, hauls wood with his goat and wagon. In fact, he can see no deficiency in the left shoulder.

CONCLUSIONS

First, primary sarcoma of the clavicle is a rare condition and the earlier the diagnosis and the more radical the treatment, the better the chances for complete recovery.

Second, the writer is of the opinion that

partial excision of the clavicle or first rib should not be practiced for malignant disease.

Third, the danger of local or general metastases is very great, and as division of the bone increases this hazard, excision should be made with the bone intact.

Fourth, because of the favorable results obtained in the few cases of sarcoma of the clavicle and the larger number of sarcoma of the long bones, it is advisable to use the mixed toxins of erysipelas and bacillus prodigiosus for two or three months after operation.

Fifth, under modern aseptic conditions the mortality for excision of the clavicle and excision of the first rib should be comparatively small, and, considering the fate of the patients who are denied surgery, the opportunity of relief by surgery is mandatory.

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This paper is based upon an experience gained from 253 human bone-graft cases over a period of three years, also a large amount of animal experimentation devoted to the study both macroscopic and microscopic of the bone graft when used in ways similar to the technique employed in the human cases.

The following technique of applications of the bone-graft involves the author's original usage so far as the writer is informed, with the exception of three incidences.

These cases have been operated in the past three years and include 178 cases of Pott's disease sixteen wedge-graft corrections in case of congenital club-foot, seventeen iliac grafts for ununited fractures of the long bones fourteen cases of paralytic foot deformities the remaining twenty-eight cases include bone-graftings for fixation of tubercular ankle repair of osteomyelitic cavities transplanting astragalus for absent head and neck of femur the correction of paralytic drop-wrist deformity of the tibia following fracture, underdevelopment of the jaw fixation of tubercular knee reinforcing the bony deficiency and muscular weakness in spina blanda in conjunction with arthroplasty for paralytic dislocation of the hip congenital dislocation of the hip paralytic scoliosis, restoring depressed nasal bridge fixation of tubercular sacro-iliac joint, ununited fracture

of the spine ununited fracture of the femoral neck congenital absence of tibia, replacing bone deficiency following removal of osteosarcoma mobilizing ankylosed hips and carpus by the use of osteocartilaginous grafts.

Enough time has not elapsed in some of the later cases to be able to draw trustworthy conclusions as to their ultimate results. But as our early cases have proved the permanency of the graft and result up to three years, and as other observers have followed bone-graft cases even as long as thirty years, we believe that the reliability and permanency of the bone graft has been sufficiently proven.

We agree also with McWilliams that the periosteum on the graft plays an important rôle in aiding to establish a more abundant and earlier blood supply or nutrition to the graft, as I have previously stated.

The endosteum and the marrow substance also serve a similar purpose to the periosteum, either acting as a ready medium through which the bone transplant gets its nutrition, or in case the bone-cells in the graft die furnishing living active cells through which the graft is regenerated.

The membranes covering cortical bone act largely as the physiological media through which these cortical cells naturally get their nutrition again their loose structure is very favorable to taking up nourishment or establishing vascular means to that end with the environment in which they are placed. Therefore the wisdom of including these structures on all grafts is obvious. Attention should also be called to the fact that the bone graft stimulates an active osteogenesis on the part of the recipient bone itself therefore contributing further in this way toward the assurance of permanency of result.

The execution of the technique involved in the application of the bone-graft in many

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of the conditions enumerated above would be difficult slow and inaccurate, except for the adaptation of the electric motor and the author's attachments, such as special twin saws, drills, burrs and dowsing instrument. These save time avoid traumatism both to bone and soft tissue, favor precision in molding the graft and preparing its bed simplify and make easier the technique in deep wounds and regions difficult to get at with hand tools (Fig. 1).

A rapidly revolving motor instrument, according to Crile's kinetic theory should diminish shock on account of the lessened excitation of the afferent nerves from a rapidly moving instrument and consequently the minimum resultant disturbance to the nerve centers.

From clinical observation it is apparent that whatever shock occurred when hand bone cutting instruments were used has largely if not entirely disappeared since the development and use of the motor instrument. Whether this is due to the marked shortening of the time of operation or to Crile's theory or to both, and in what proportion it is very difficult to demonstrate.

The impossibility of obtaining actual immobilization of diseased vertebrae in Pott's disease by any external means, whether by spinal brace, plaster of Paris jackets or recumbency was the chief stimulus which caused the author to resort to the bone transplant as the simplest and most trustworthy means of actually immobilizing the diseased vertebrae.

Additional advantages of internal fixation by the bone-graft are obvious such as the correction of the kyphosis in suitable cases, and the prevention of progression of deformity by controlling the leverage action of the involved vertebrae. It accomplishes this by its splint action and by preventing the separation of the posterior ends of the lever which are the spinous processes. This prevents the approximation or crushing together of the anterior arms of the levers which are the bodies. This is most important, as crushing of the vertebral bodies due to superincumbent weight, muscular spasm and respiratory action is a most important factor in causing the

prolongation of the convalescence of Pott's disease.

It is also believed that internal bony immobilization of a tubercular joint, in conjunction with a proper régime of life for tuberculous patients is the most ideal treatment. This is immediately obtained by use of the bone-graft as herein described (Fig. 2).

Calvé and Lelievre confirm Minard's statement that osseous tissue affected by tuberculous is never restored from the diseased parts and that if partially destroyed vertebral bodies are held apart for a long time by plaster of Paris jackets or other external support, they will come in contact again and the kyphosis will recur when these supports are removed. This is an additional convincing reason for the use of the bone graft in producing a bony union by implanting it into the uninvolved posterior segment of the vertebrae with the kyphosis corrected and the diseased vertebral bodies separated.

The perfected technique of the author's operation for Pott's disease ununited fractures of the spine, etc., is as follows (Fig. 3). With the patient in the ventral position the tips of the spinous processes are reached by a curved incision and turning up of a flap of skin and subcutaneous tissues. With a scalpel the periosteal tips of the spinous processes are split in the center also the supraspinous ligament. The inter spinous ligaments are next split into approximately equal parts, to a depth of about one-half inch (12.70 mm.) varying with the age and the size of the patient without disturbing their attachments to the spinous process. Very little haemorrhage results, because only dense ligamentous tissues are incised which is in considerable contrast to the haemorrhage resulting from the separation of the muscles from the spinous processes in a deeper operation such as a laminectomy etc. With a thin sharp chisel or author's osteotome and mallet each process is split longitudinally into equal parts for a depth of about one-half inch (12.70 mm.) care being taken that greenstick fractures are produced on one and the same side of all the spinous processes so split. The unbroken halves

preserve intact the leverage of these processes. A separation of the halves of each spinous process produces a gutter into which the transplant is later placed. In all cases the full thickness of the tibial cortex is included with the periosteum, endosteum and attached marrow substance, thus producing a transplant with approximately a rectangular cross-section.

It has been found advisable for bone grafts for all purposes to include periosteum and endosteum as it is through these media that cortical bone largely receives its nourishment. Thus the graft approximates a complete organic structure with its normal means of distributing nourishment and the early establishment of blood supply is enhanced.

A graft of this thickness necessitates producing a full fracture of one half of the spinous process and setting it over laterally in order to place it deep enough to be well covered with the above-mentioned ligaments. It is important that the spinous processes be split *in situ* with all the ligamentous and muscular insertion undisturbed as in this way none of the natural supports of the spine are taken away and the ligaments afford, by means of strong ligatures, an excellent medium for firmly fixing the bone splint in place.

The depth to which the spinous processes are split varies as to age, size of patient, and amount of pressure atrophy from former apparatus etc., which may so reduce the spinous processes as to prevent mere tubercles on the posterior aspect of the neural arches and in certain instances can be split in depth only three-sixteenths to one fourth of an inch (4.75 to 6.35 mm.) but this affords good bone contact, and as the graft is embedded into longer spinous processes at either end, it affords the usual efficient fixation. A hot saline pack is placed over the back wound until the bone insert is obtained.

With the patient still in the ventral position the leg is flexed on the thigh and an incision over and down to the crest of the tibia is made. The fascia and subcutaneous tissues are carefully separated from the

periosteum of the anterior internal flat surface of the tibia. From its crest and anterior internal aspect a strip of the tibia is removed with a motor saw. A motor saw affords a very rapid and exact method of securing the graft and is used exclusively for this purpose. The length of graft varies according to how many vertebrae are to be spanned *i. e.* all those diseased and two healthy ones on each side, if in the dorsal region, and one on each side if in the lumbar region, its breadth from one fourth to five eighths inch (6.35 to 15.85 mm.) Its thickness from three-sixteenths to three eighths inch (4.75 to 15.51 mm.) according to the size of the patient. The graft is inserted between the halves of the interspinous ligaments and the spinous processes with its edge anterior or innermost and its cut side or marrow side in contact with the unbroken halves of the spinous processes. It is held firmly in position by interrupted sutures of heavy or medium kangaroo tendon which are passed through the supraspinous ligament and posterior edges of the halves of the interspinous ligaments near the tips of the spinous processes, beginning at the center of the graft. The ligaments are then drawn over the insert posteriorly by tense sutures placed closely together. Before tying the last suture the posterior corners of the ends of the graft are removed by the rongeur forceps and these fragments of bone with others are cut into small pieces and placed under and about each end of the graft. The end of the graft are then drawn down and sutures tied. This is important as it furnishes multiple foci for a rapid proliferation of bone as according to MacCawen the smaller the graft the greater the relative bone growth. If there is a moderate kyphosis of short duration it is entirely obliterated any kyphosis of a few years or less duration becomes much diminished, either at the time of operation or during the first few days after from the corrective effect of the lateral tension of the graft.

This sequence of the technique is important because, by preparing the back wound first and packing it with a hot saline compress, we secure hemostasis, and control the blood clot about the graft, a condition to be desired.

A certain amount of blood-clot is desired as it facilitates bone growth. The serous zone which takes place from the several tissues furnishes a good culture medium for the bone graft. This medium, blood, serum or plasma, has been sought in preparing tissue cultures for the microscopical study of cellular bone growth. Cold abscesses about the spinous processes are rare, but when found do not usually interfere with satisfactory union. Where a kyphos is too great for implanting a straight splint properly in place in the spinous processes, the approximate contour of the knuckle is obtained by bending a silver probe over the tips of the spinous processes. The curved probe is then laid upon the anterior internal aspect of the tibia as a pattern, and a graft of the desired shape, width and thickness is outlined in the periosteum with a scalpel. The graft however is always straighter than the kyphosis and the spine is straightened by usual pressure and drawn to the bone-splint by means of the heavy ligatures. When the deformity is too great, even for this method the graft is placed with its wider diameter in a lateral rather than anterior posterior plane and then bent into place between the halves of the spinous processes and held with heavy kangaroo tendon, as above indicated.

This bending is accomplished by making numerous saw-cuts one half to two-thirds the way through. These cuts not only shape the graft to the kyphos, but also favor a rapid establishment of blood supply and the throwing out of bone callus from the graft itself. The cross cuts one-eighth to three-eighths inches (3.17 to 9.51 mm.) from each other are always made on the marrow side. The transplants vary in size from four to seven and one half inches (10.16 cm. to 19.05 cm.) in length, one fourth to one half (6.35 to 12.70 mm.) in width, one fourth to three-eighths inch (6.35 to 9.51 mm.) in thickness. Care is taken that the insert has some bone marrow. The importance of this has been pointed out by several German investigators. Before placing the unbent graft in its bed its periosteum is incised in many places, so as to allow the underlying osteogenetic cells exit for proliferation, and also an entrance

of blood supply to the graft. The graft, firmly embedded under tension in the spinous processes and the dense intraspinous ligaments afford immediate and excellent fixation of those vertebrae involved even before union takes place. This is confirmed by the immediate disappearance of pain in adults, and pain and night cries in children. The environment of the spinal insert is most favorable; it is not only wedged into healthy spinous processes, which are less than three-fourths inch (19.05 mm.) apart, but is also surrounded throughout its entire extent by ligamentous tissue which is normally attached to bone. The conditions are favorable to a rapid establishment of an haversian blood supply from the spinous processes to the graft. The writer believes that the fact that the spinal graft rarely shows any evidence of disintegration or absorption is explained in this way. Where the kyphosis is marked and angular greenstick fractures of both halves of the prominent spinous process are produced with this osteotome, and their tips turned in laterally and sutured in contact with posterior surface of the transplant. This produces additional bone contact for graft and reduces the kyphosis by so much.

Post-operative treatment. Although it is known from experimental work that the graft becomes united by bony union in four weeks, nevertheless the patient is confined in the recumbent position on a fracture bed for six to eight weeks. After this he is allowed to walk about without apparatus for part of the day. Where a straight graft of sufficient length is used, there is no necessity for a plaster jacket or support. In dorsal cases, where a deformity has developed, necessitating pronounced bending of the graft, a spinal support may be advisable for a few months. It should be emphasized that these cases should be under the observation of a surgeon experienced in this line of work throughout their whole convalescence. The relief of pain and acute symptoms is most satisfactory. External spinal supports, a plaster jackets and braces should always be added not only on account of their interference with normal function of respiration, but also on account of their injurious effect on

the graft itself not only from pressure but from interfering with its function and the stimulus derived therefrom. This is realized by every investigator of bone work.

Indications for operative treatment. Fixation by the bone-graft is indicated in all cases at all ages, where pain or muscle spasm demand immobilization of the diseased vertebrae and the earlier the operation the more favorable the prognosis. It is indicated for the prevention and correction of increasing deformity and is even more urgent in the presence of complicating conditions such as psoas spasm, cold abscess or paraplegia.

The only special contraindication is the inability to secure a clean field of operation. This, however, is rare as these cold abscesses seldom point in or invade the region of the spinous processes. Uninfected cold abscesses between the spinous processes, however, have not interfered with primary union.

Prognosis. The prognosis in all operated cases is most favorable as to relief of all symptoms and increase of deformity. Correction of deformity is most favorable in cases operated early and cases of longer duration where kyphosis is sharply angular or presents a considerable amount of motion. In the one hundred and seventy-eight cases operated a surprising amount of respiratory mobility was noted in the anterior kyphosis. In all early cases and in a considerable percentage of cases of even four to six year duration. These observations were made after the spinous processes were exposed and while the patient was lying prone on a firm surfaced operating table breathing quietly under an anesthetic. Under these conditions light motion in the midline existed between the healthy vertebrae above and below the kyphosis. The undoubted reason for this increased motion in the diseased area is the loss of support by the destruction and absorption of the diseased vertebral bodies leaving only the lateral masses with their intact and the spinous processes supporting the lumbar.

Paralytic scoliosis. In cases of flexible paralytic scoliosis uncorrectable when the trunk is in the erect position where there are large angular curves grafts have been

implanted in six to eight of the tips of the transverse processes of the convex side at the apex of the sharpest curve after straightening in a similar manner as that in applying the graft (author's) to Pott's disease.

The treatment of these cases otherwise impossible to control by external supports such as plaster jacket, corsets or braces, has been much facilitated.

The graft however acts only as an adjunct to external supports.

Spina bifida. In cases of spina bifida (Fig. 4) where the meningocele has been controlled and a large deficiency of vertebral bone exists together with weakness as evidenced by lordosis or other deformity, the bone-graft offers an excellent means for strengthening the weakened spine from the congenital bone deficiency.

The technique is somewhat similar to that adopted in Pott's disease. Modification is necessary on account of the absence of spinous processes and part of neural arches. The spinous processes above the cleft and the lateral masses of the last lumbar vertebra and the first part of the sacrum are reached from each side by two curved skin incision as it is undesirable to interfere with the nerve tissue which is usually involved in the cicatrix following the operative reduction of the meningocele. The second spinous process above the left is split longitudinally and a green tick fracture produced in each half. The first spinous process above the cleft is removed from muscular and ligamentous attachment and both sides freshened. Below the left the lateral masses of the fifth lumbar vertebra with the congenitally deformed humps of the neural arches if sufficiently prominent and the first segment of the sacrum which is usually congenitally hypertrophied are split with the osteotome and the halves separated to receive the lower end of the bone graft.

The wound is packed with a saline compress and the bone graft is prepared and removed from the rest of the table, long enough to reach from the split spinous process to the sacrum below. The upper ends are beveled so that when these have been fastened with the graft firm contact

angle like an inverted V. The grafts are placed at this angle in the beds prepared for them and held firmly in place at their bony contact by drawing the split ligaments over them with interrupted sutures of medium kangaroo tendon. The technique is similar to that of the bone-graft applied for Pott's disease. Skin wound are closed, and the patient placed on a fracture bed for six weeks.

Fracture of the spine. In cases of persistent non-union following fracture of the spine preventing pain disability and increasing deformity the bone graft is indicated and should be inserted as for Pott's disease.

It is also indicated in fresh fractures of the spine: *pondylitis traumatica* (Kummell's disease) and neuropathic spine (Charcot) where on account of a rarefying osteitis crushing of the vertebral bodies and increasing deformity is likely to produce cord compression.

Tuberculosis of the sacro-iliac joint. The prognosis of tuberculosis of the sacro-iliac joint when treated by conservative method is most unfavorable. Tubby states that 79 per cent only recovered in the moist type when treated by conservative means in a series of thirty-eight cases. As in the case of bone and joint tuberculosis elsewhere the prognosis is more favorable in children than in adults. This joint is most unfavorable for external splint fixation largely on account of its anatomical architecture. Its joint surfaces are oblique in lining from above downward, forward and outward. Its strength is wholly dependent upon its ligaments. It furnishes no chance for leverage control.

The sacrum on account of its extreme inclination is at the disadvantage of being an inverted key to an arch.

Conservative treatment is best carried out by the double Thomas' hip splint or the double plaster of Paris spica in conjunction with recumbency during the acute stage.

Internal bone fixation offers the only satisfactory means of immobilization on account of the above-mentioned anatomical conformation together with the very powerful muscle action which affects this joint (Fig. 5).

The following technique has been devised by the author for using the bone graft in

this condition and has furnished most satisfactory results. The posterior superior spine of the ilium, the wing and first posterior spine of the sacrum are reached by a curved incision. The posterior border of the wing of the ilium and the spinous process are split, with their attached ligaments by a thin osteotome forming a gutter to receive the ends of the graft.

If practical, a surface on the sacrum is denuded to furnish additional contact with the graft. The wound is packed with a saline compress and with the patient still in the prone position, the leg is flexed and a graft of sufficient length is removed from the crest of the tibia by the motor saw as described in the use of the bone-graft in Pott's disease. The width of the graft should be three times the thickness of the cortex. The thickness should include the whole cortex, periosteum, endosteum, and a small amount of the adhering marrow. The graft is placed in its prepared bed and the ligaments drawn over it by interrupted sutures of medium kangaroo tendon. The skin wound is closed and the patient placed on the back in a fracture bed for a period of not less than five weeks. There should be no necessity of further mechanical treatment.

In cases of non-union and certain fresh fractures of the vertebrae when displacement and cord pressure have not occurred, the bone-graft as applied by the author in Pott's disease is applicable for support and fixation.

An illustrative case is that of a young woman, referred by Dr. J. H. Johnson of Naugatuck, Conn. She sustained in a railroad accident, a horizontal fracture through the middle of the body of the eleventh vertebra. Plaster of Paris jackets were worn continuously for one year at the end of which time support was so necessary that whenever the cast became soft the patient complained of pain and lack of support and asked for a fresh jacket. The tips of the tenth, eleventh and twelfth spinous processes were exposed through a circular incision to the right turning up the flap of the skin and cutaneous tissue. These spinous processes were split en masse with the attached supra- and interspinous ligaments, with a

scalpel, thin chisel and mallet. A graft of sufficient length was removed from the crest of the right tibia and inserted in the cleft. The split ligaments, with the embedded fragments of the spinous processes, were drawn over it by means of interrupted sutures of medium-sized kangaroo tendon. The patient was kept on a fracture bed for five weeks. The support from graft thus embedded gave immediate relief although no plaster of Paris jacket was applied. At this writing one year later there is no evidence of pain or lack of support.

Ununited fractures. I have often said that the Lane plate and other internal metal splints, when applied to ununited fractures of long standing, are a hindrance rather than an advantage in securing bony union. This view has been strengthened by the accumulation of experience.

The indications for treatment in fresh fractures and ununited fractures are entirely different, although it is very evident from the discussion of these problems with anxious men and the large number of failures seen in our clinics, that many practitioners do not appreciate this difference.

In a large percentage of fresh fractures temporary fixation only is necessary to insure union, as the osteogenetic function of the fragments is active and in the presence of accurate apposition union occurs rapidly. The proper application of the Lane plate in suitable cases may fulfill all requirements.

In ununited fractures the problem is quite different. We have here in the ends of the fragments a marked diminution or an entire cessation of osteogenetic activity. This cessation of activity is evidenced in the marked sclerosis or eburnation which is always found.

The pathology of this condition of sclerosis is very similar to that found in non-ankylosing osteo-arthritis where there is an overdeposit of calcium salts and a consequent diminution and degeneration of bone-producing cells. The therapeutic requirements of these pseudo-arthroses are fixation stimulation of osteogenesis on the part of the fragments, and an osteogenetic scaffold connecting the active bone in each fragment back of the eburnated areas. The bone-graft when in-

laid according to the herein-described technique is the only means of fulfilling these requirements. Two if not all, of these three essentials are necessary in order to secure union.

The Lane plate furnishes but one of these viz. temporary fixation but at the same time it causes absorption and disintegration of bone. The bone transplant not only produces fixation but also stimulates callus-formation and grows bone on its own part.

Abundant evidence has accumulated to prove that something more than fixation is necessary in these conditions. The most favorable cases for external fixation, such as fracture at the middle third of the tibia with the tibia intact have failed to unite in spite of 4 months of effectual splinting and recumbency in bed. Operation showed no interposition of soft tissues and there was no evident reason for non-union.

Codrville appreciated the above mentioned therapeutic requirements and met them partially by spanning the fractured area with a very thin autogenous periosteal graft which has given in the hands of others a fair percentage of good results. But it was not an ideal procedure in that it did not furnish efficient fixation. It did not stimulate osteogenesis between the ends of the fragments because it was entirely superficial and it did not penetrate cortical bone structure. Being extra-osseous it therefore furnished an imperfect graft environment.

Murphy has evolved a better method in his use of an intramedullary dowel which furnishes more effectual fixation and being entirely intra-osseous, favors stimulation of osteogenesis by better contact of graft to recipient fragments. It is, however difficult thus to get contact to active bone beyond the sclerosed area which is most important. It is also difficult of application in small bones such as those of the forearm, where the medullary canals are small. As in the case of the intramedullary aluminum splint of Elsberg it is most difficult to secure the necessary lateral fixation in fragments, in such cases as fractures of the ulna and radius where these bones have been contracted together during long existing non-union.

An illustrative case that will be mentioned later was that of an ununited fracture at the middle of the radius of four years duration. After four unsuccessful operations, including Lane plating the radial fragment ends were found closely contracted to the side of the ulna. They were freed with difficulty and held in proper alignment by a long inlay bone-graft. On account of the strong tendency of the angulation to relapse the necessary lateral fixation would have been impossible by any intramedullary splint. The problem was easily solved by the leverage action of a long inlay bone-graft. It is always difficult to get a tight fit of the intramedullary splint into both fragments.

The technique applied in twelve of my cases, namely fractures of the tibia, shaft of the femur, radius and humerus, was as follows. The fractured area was exposed by a generous skin incision. When the fractured bone is superficial, as in the case of the tibia, the incision is made lateral to the intended site of the bone insert. The skin and subcutaneous tissue are retracted the bone ends are developed and freshened with chisel, motor burr or saw and the sclerosed bone plug is removed from the medullary canal.

If there is overlapping of the fragments the amount of pull required to correct it varies with the degree of overriding at the site of fracture. In the case of a fractured femur in a muscular man as much as a one hundred and fifty pounds pull may be necessary to secure sufficient extension. In this instance it is far better to set up and adjust a traction pulley apparatus with heavy weights, or use the Hawley fracture table. Either of these provides a constant and uninterrupted pull. If the fragments still overlap and sufficient extension cannot be made to bring them together it is necessary to trim off the fragments with motor burr saw or chisel until good position can be secured. This will produce shortening but it cannot be avoided.

The fragments are now held in good alignment by an assistant. The periosteum is divided with a knife longitudinally over the bone to be removed in making the gutter for the bone insert. Periosteal flaps are turned back to either side, exposing the bone (Fig. 6)

Two parallel saw cuts, about three-eighths of an inch (9.51 to 12.70 mm.) to one half inch apart, are made longitudinal in the fragment ends completely through the bone cortex to the marrow cavity with a motor twin circular saw (Fig. 1). The distance between the saw-cuts is arranged by adjusting the distance between the twin saws. These cuts are made from two and one-half to three inches (6.35 to 7.62 cm.) into the end of each fragment from the line of fracture.

While the fragments are held in good alignment, they should always extend far enough from the line of fracture to reach well into the non-sclerosed active bone of either fragment. This distance is subject to considerable variation, depending upon the site of fracture and the amount of eburnation present. The distance the twin saws should be apart, i. e. the width of the gutter for the graft, should be from $\frac{3}{16}$ to $\frac{1}{2}$ of an inch (7.93 to 12.70 mm.) according to the size of the bone. The revolving saws are kept constantly bathed in saline solution by a spray connected with a sterile tube to a fountain syringe. This prevents the development of excessive heat from friction which should always be avoided on account of its devitalizing effect upon peripheral bone-cells.

After the twin saws have traveled the desired length to make the gutter for the graft the bone fragments between the saw cuts are removed by severing the ends distal from the point of fracture with a narrow osteotome in such a manner as to effect a tongue and groove joint with the ends of the graft (Fig. 10). With motor driven drill holes are bored in the cortex on either side of the gutter slanting inward to the marrow cavity. These holes are placed near the line of fracture so as to fix the center of the insert. The ends of graft are secured in position by the above mentioned tongue and groove joint, when fusible or by additional sutures. This joint is very quickly shaped, and the greater the muscular contracture the more securely is it held in place (Fig. 7).

The exact length of the desired insert is obtained by measuring the gutter and transferring this measurement to the exposed anterior internal surface of the opposite tibia.

A flexible probe is usually satisfactory for this purpose, a right-angled bend marking the exact measurement.

The wound and gutter are packed with hot saline compresses while the graft is being prepared. The patient remaining in the dorsal position the graft yielding tibia is exposed by an incision over its crest. The overlying structures are retracted and the size and shape of the graft are outlined in the periosteum by means of the scalpel with the probe measure as a guide. With the twin saws adjusted to the same distance apart as when forming the gutter bone cuts are made to the marrow cavity along the antero-internal tibial aspect. With a narrow osteotome or small motor-driven saw or burr the graft is now dislodged and the ends grooved with the motor saw to fit the triangular tongue of the gutter ends.

A double strand of heavy kangaroo tendon is passed through the drill holes previously made. One strand in each fragment is now pulled up from the bottom of the gutter and the graft is placed under them. Traction is exerted on the limb and the graft is forced into position.

A good fit is assured because the same adjustment of twin saws is maintained both in forming the gutter and in removing the graft, and they must be of equal and uniform width through their whole extent. Traction is now removed and the elasticity of the soft parts force the tongue and grooved end into tighter adjustment. The kangaroo living sutures are then drawn taut and tied over the graft.

It is readily seen that this not only affords most effectual fixation but also furnishes a most ideal environment for the bone graft. It brings each structural layer of the graft into close apposition with its corresponding layer in the recipient fragment namely periosteum to periosteum, cortical bone to cortical bone, endosteum to endosteum and marrow substance to marrow substance. Periosteum, and when possible endosteum and marrow substance are always included in the graft. We have proved by animal experimentation that this close contact of Haversian system assures permanent union.

At least of a large portion of the insert. The bone which has been removed from the ends of the graft in order to form the above mentioned grooves and other normal bone fragments are finely chipped with a rongeur and pushed between and placed about the ends of the fragments at the line of fracture wherever possible.

These act most effectively as supplementary foci of osteogenesis. Macewen has well pointed out that the osteogenetic efficiency of a bone graft varies in inverse ratio to its volume. The smaller the graft the greater the relative osteogenesis.

The site of the fracture is covered with the periosteal flaps which were reflected to expose the bone to be removed. This gives two layers of periosteum covering the transplanted fragment. The overlying tissues and skin are closed without drainage. The leg wound is closed in a similar way except that the adjacent muscles are drawn into the cavity from which the graft was taken. Splints are applied and not removed before five weeks.

ILLUSTRATIVE CASES

CASE 31. S. female 45 years old always healthy. Four years previously she fell fracturing the right radius at the junction of the middle and distal thirds, the ulna remaining intact. Fragments reduced under ether, union occurring in eight weeks. fracture was cut down upon and muscle freed from the bone ends. Good apposition was secured but no union followed. A second open operation as performed and the fragments nailed together. Again no union resulted. At a third open operation the fragments were wired, but again no union followed. Ten years after the fracture a fourth operation. Lane plates were applied and this also as followed by non union. Two years later four years after the fracture the patient in desperation consulted me to determine whether something further could not be done for her arm was both painful and useless.

November 9, 1913 (Fig. 8) the fracture cut down upon and the Lane plate was found loose in the periosteous tissue. Two of the screws were found to have large circular cavities in bone in which they had loosened. There was depression of the side of the fragment ends where the metal plate had used an absorption of bone. The radial fragment shown in Figs. 3 and 4 were much shortened from the previous operation and the metacarpal end badly angulated toward the ulna. Their ends were made fresh and with much difficulty brought into alignment as corrected. This caused the



Fig. 2. A very acute case of tuberculous of lumbar spine three months after bone-graft was inserted. Child has remained off one year after operation.

There are many technical difficulties in connection with bone work which could never be overcome except by assistance of the motor saw and its various adjustable attachments.

In the repair of deformity and the result of traumatism of the skeleton the advantage of



Fig. 3. Lateral skilgram of dorsal spine with graft bent into and united to the spinous processes. There was large kyphosis in this case, of long duration and only small amount of correction. This illustration used here to demonstrate the desired location of the graft is the tips of the spinous processes and the amount it was possible to bend the graft and still hold it by the ligaments drawn over it.

the use of its own material and of the avoidance of the former seemingly necessary foreign substance has been clearly demonstrated.

Metal introduced into the tissues is in most respects the direct antithesis of the bone-graft. It favors infection absorption, and disintegration of tissue.

The bone-graft being living tissue has certain germ-resisting properties. It immediately becomes adherent and fixed to the contact ing tissues. It not only stimulates the bone with which it is contacted to increased osteogenesis but it proliferates bone of its own initiative.

ERATION OF THE KNEE JOINT WITH BONE TRANSPLANTATION

This procedure is for the treatment of acute adult tuberculosis and the correction of

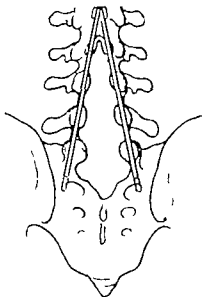


Fig. 4. Diagram showing author's method of straightening or supporting bifid spine (spina bifida) by the insertion of autogenous tibial grafts.

complicating deformities as fibrous or incomplete bony union.

Before entering the tuberculous joint a graft, eight inches long is removed from the anterior internal surface of the tibia by the twin saw adjusted seven sixteenths of an inch (11.09 mm) apart and placed in saline solution until wanted. If the patella is not too much involved it has been used by the writer instead of the tibial graft. By sawing it into inlay grafts it serves the purpose very well.

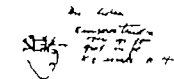
With an Fsmarch bandage about the upper thigh the knee joint is reached by a large U-shaped incision with the lowest point of the curvature over the tubercle of the tibia. The ligamentum patellae is divided at its insertion, and the patella is turned upward and removed. The lateral ligament is cut and the leg flexed in the thigh to the extreme.

The tubercular soft tissue is trimmed away with scissors. With a narrow saw a thin section consisting of the artilage with the underlying bone (6.35 mm to 8.40 mm in thickness) is removed by a saw cut approximated parallel to the axis of the condyles of femur. With the same instrument a section about the same thickness is



Fig. 5. X-ray taken three months after the insertion of two autogenous tibia grafts for lumbar sacral and microdysic tuberculous osseous. b, is spinal graft inserted in spinous processes of the fourth and fifth lumbar vertebra and the first sacral vertebra. d is the second graft which has been inserted into graft a, b inserted at posterior wing of the ilium.

It is six months now this child is operated on he has played about with other children without evident symptoms for the past four months, I thought I ought to mention no external support.



Core section of the bone graft

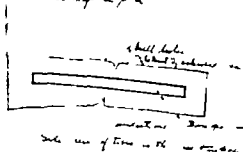


Fig. 6. Cross-section of tibia with graft and skin incision. Also longitudinal section showing the graft in place.

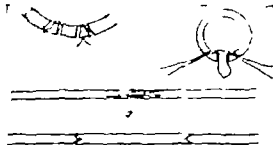


Fig. 7. Illustrates 1. strands kangaroo tendon passed through drill holes ready for graft to be slipped into gutter with one strand above and the other under the graft. 2. Knots are brought over graft area and tied. 3. Longitudinal section of long bone, illustrating sclerosed site for fracture ends, also graft dovetailed into position.

removed from the head of the tibia by a concave cut, producing a surface which will fit over the convex surface already prepared on the condyles of the femur.

The bone should be so removed that when the cut surfaces are approximated the leg is straight.

The anterior lateral surfaces of the upper end of the tibia and the lower end of the femur are each exposed for about three inches.

The periosteal structures are incised down to the bone, on each side of the patella on both tibia and femur parallel with their long axes, and turned sideways with the periosteum elevator.

With the circular motor twin saws adjusted the same as when removing the graft and the tibia and femur held in good apposition, two parallel cuts are made two inches into each bone at their antero-lateral corners on either side of patella. The strips of bone between the saw-cuts are removed with a small motor burr and narrow chisel.

Holes to receive graft retaining kangaroo sutures are made in the cortex laterally to the gutter in each bone, or the grafts may be held by autogenous dowel grafts as described in author's technique for ununited fractures. The sutures are inserted by large curved needles or flexible probe and pulled up from the bottom of the gutter in the form of large loops, under which the graft is placed and pressed into its bed. The sutures are then

drawn tightly in place over it and tied. The graft, thus applied, assumes efficient fixation and supplies an active osteogenetic factor and stimulus to the bones into which it is inserted without the use of foreign material, as metal plates, screws, or wire.

The necessity in these cases for some internal fixation has been appreciated in the orthopedic service of the Massachusetts General Hospital, according to Dr Goddu, since December 1909, and internal metal plates and clamps have been used in all excisions of knees, and even under these conditions two out of eight cases required re-excision, on account of inability to form sufficient callus. Goddu mentions twenty-seven cases done in three years, of which four only showed union within six to twelve weeks; four required re-excision. In one case silver wire had to be removed on account of a discharging sinus.

"In three cases where the bones were drilled and held by suture material, in one the suture broke, allowing displacement of the ends of femur and tibia, and a reposition under ether was necessary. In one other there was considerable motion at the end of eight weeks.

On account of similar experience the author has used, instead of the metal plate, the inlay bone-graft which he believes is far superior.

PARALYTIC AND CONGENITAL DISLOCATION OF THE HIP—AUTHOR'S ARTHROPLASTY WITH BONE GRAFTING

In paralytic dislocation of the hip the rim of the acetabulum is much worn—or as it seems, absent—when slipping the hip in and out.

The capsule is much relaxed and the muscles about the hip lengthened.

Cases of congenital dislocation of the hip that have been reduced by the bloodless method (Lorenz, Calot) two or more times become somewhat similar to those of paralytic origin, except that the periarticular tissues being properly innervated are although much stretched, not nearly as lax or flaccid. In some cases the head slips in and out of the acetabulum with as much ease as in the case of the paralytic hip. In most cases, however, a reduction can only be accomplished when



Fig. 8. These are skilograms of the untreated fractures of the radius described in the text. A, Shows the radius after four years of non union and four operations and the Lane plate in position six years after its application. Much destruction of bone has resulted with consequent

shortening of the radius. B, Shows the graft in place with firm union of graft to fragments. The ends of the fragments separated and the radius lengthened about 2.50 cm. Firm union and a good functional arm is the result at this writing, six months after insertion of the graft.

the child is under an anæsthetic in either event the hip slips in and out of the acetabulum with evidence of an insufficient acetabular rim.

The first is best obtained by the formation of an efficient acetabular rim and a proper tightening of the relaxed capsular ligament the second by a minimum interference with joint cartilage. Hoffa's operation of deepening the acetabulum by the removal of cartilage and bone has been the one of choice. Its disadvantages however are great in that it may result in an immediate marked limitation of motion and pain. Even good functional joints resulting from this procedure have years after become painful and much limited in their motion undoubtedly largely due to an extensive removal of cartilage and an

exposure of a large surface of bone which is prone to proliferate.

The anatomical defects, it seems to the author are best overcome by the following operation

AUTHOR'S TECHNIQUE FOR RECURRENT DISLOCATION OF THE HIP

The hip is reached by a lateral incision and the turning up of the upper part of the great trochanter together with the attached muscles (Fig. 11)

The capsule of the superior part of the joint is developed without incising it. With a wide thin osteotome a broad bone incision about one half to two-thirds of an inch above and parallel with the superior edge of the acetabulum is made obliquely down to the



Fig. 9. X-ray case, female 60 years old. wounded fracture of the neck of femur repaired by dowel graft removed from tibia and shaped to fit drill hole.

Note new bone protruding from outer end of graft. Operation resulted in firm union.

joint cartilage at a point about the same distance internal to the edge of the acetabulum. A sufficient reef is then made with silk sutures in the posterosuperior or overstretched part of the capsule in order to tip down the loosened edge of the acetabulum and thus hold it in that position so as to form an exaggerated acetabular rim. This opens up a wedge-shaped cavity above the acetabular rim by the displacement outward of the bone fragment.

Measure of this cavity are taken with calipers and a wedge bone-graft is procured either from crest of the tibia or the remaining portion of the great trochanter. If it is necessary to shorten the trochanter muscles the graft is always removed from the base of the trochanter and when the reflected portion of the trochanter with its attached muscles are replaced its position is lower by the thickness of the wedge graft removed thus tightening the muscles to that extent.

The graft is drilled and fixed in place by two sutures of medium kangaroo tendon. The transplant thus fills the wedge cavity above the acetabulum at the same time that it assists the shortened capsule in holding the fragment in its new position.

This procedure preserves all the joint cartilage, is not difficult of execution, and fulfills every anatomical requirement.

THE BONE WEDGE GRAFT IN TREATMENT OF CLUB-FOOT

The severer types of club-foot in children over two and one-half years of age may be considered under two groups, in order to simplify the description and choice of method of treatment. The salient characteristics of the first group are a foot not markedly shortened but marked adduction of the fore-foot, moderate varus and equinus. The heel is well formed, but much elevated and cannot be brought to the ground. The inner border of the foot is concave and shorter as compared to the outer convex border the cuboid, if hypertrophied and prominent, is only moderately so. The foot is somewhat smaller than its fellow due to under-development.

In the severer or relapsing cases of this group when the tarsus resists correction by tenotomies and wrenchings, it is remodeled by placing a bone-graft into the inner short or concave side of the tarsus at the point of its greatest concavity which is at the scaphoid bone.

AUTHOR'S TECHNIQUE OF THE APPLICATION OF THE BONE

Graft wedge (Fig. 12) In addition to preparing the deformed foot for operation, the leg is also prepared at the same time. A subcutaneous tenotomy of the tendo Achillis is done, and the equinus deformity is corrected. It is important that the heel should be thoroughly brought down, using the foot as a lever over the lower end of the tibia. With the foot on a sand bag a U-shaped incision is made and a flap of skin and subcutaneous tissue is turned back sufficient to expose the inner aspect of the scaphoid. With a sharp osteotome the scaphoid is split into anterior and posterior halves.

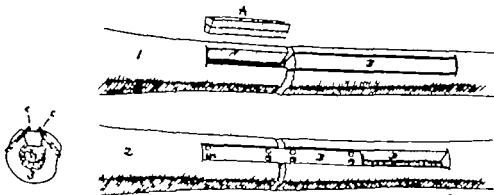


Fig. 1. Diagram illustrating the application of the iliac graft to fresh fractures, preferable to the Lane plate. On account of the absence of any marked pathological change in the fragment ends of fresh fractures, bone material from this source can be used to advantage as can be seen from the cut. In A and B are re-

moved with motor saw. Is split into two or three long strips of bone which are made round and of proper size (C, C') with author's doweling instrument, B is then placed in position as indicated in 1 and 2 and firmly held by the dowel (C, C'). The space is the cortex, D, remains empty.

The correction of the adduction and varus deformities is accomplished by the forced separation and readjustment of the planes of the scaphoid halves. While an assistant holds the foot in strong over-correction the distance between the scaphoid halves is determined by calipers. The wound in the foot is then packed with saline compress. The

crest of the tibia of the other leg is now exposed below the tibial tubercle and a wedge graft is outlined in the periosteum by a scalpel one-eighth to one-fourth of an inch thicker than indicated by the caliper measurement previously taken of the scaphoid cavity. With the small motor saw cuts are made along the periosteal incision through the bone cor-

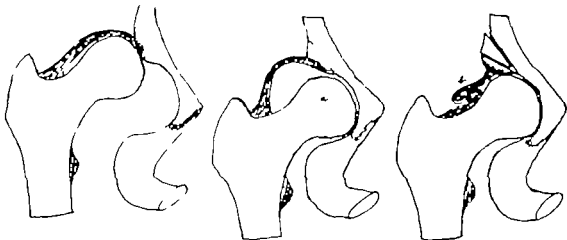


Fig. 2. Diagram of arthroplasty with the application of the bone-edges graft for paralytic dislocation of the hip and cases of congenital dislocation. When the head of the femur will not sit in the acetabulum on account of the shallowness of the acetabulum and the absence of its rim. Represents the head of the femur reduced and in the acetabulum. The capsule is shown much over stretched and the acetabular rim absent. The dotted

line indicates bone section from just above the insertion of joint capsule down to the top of the joint. b, Shows the capsule reeved with silk sutures and the postero-superior portion of the acetabular edge pulled downward forming lip, to aid the shortened capsule in holding the head in place. Is edge shape graft placed in the cavity of the same contour between the cut surfaces of the new acetabular lip and the pelvis.

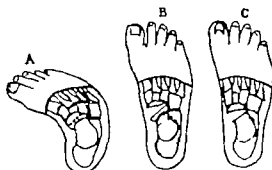


Fig. 2. a, Is diagram showing the elements of adduction deformity of congenital club-foot. The dotted line indicates here the scaphoid is split. b, Shows the foot after osteotomy of the scaphoid and forcible correction of the adduction and varus deformity by the separation of the scaphoid and rotation, at that point, of the forefoot on the posterior part of the foot. c, Edge cuboid, or tibial graft may be used to fill this space, according to the severity of the deformity and hypertrophy of cuboid. b, Indicates the cartilage removed from the posterior surface of the scaphoid and the head of the astragalus in case of acquired paralytic club-foot (talipes equinovarus) his hypermobility. A correction of the deformity causes separation of these two cut bone surfaces. The cavity is filled by edge tibial graft.

tex. Before disengaging the graft from its bed drill holes are made in its center with the motor drill. The graft is then removed by wedging a thin narrow osteotome into the saw-cuts, and is threaded on a strand of medium kangaroo tendon each end of which is threaded into a strong cervix needle.

One needle is forced through the anterior half of the scaphoid from the cut surface side by a strong needle holder and the other through the posterior half from its cut surface side. In older cases a drill may have to be substituted for the needle, on account of the density of the bone.

The graft, which is slightly larger than the cavity in the scaphoid, is then forced into position between the two halves of the cut scaphoid thus closing up the tarsal joints which have been separated anteriorly and posteriorly by the force exerted by the assistant in correcting the foot. The kangaroo tendon suture is then drawn taut over the graft and tied. The periosteous structures are drawn over the graft and sutured with chromic catgut, and the skin wound is sutured with plain catgut.

With the foot over-corrected and the knee flexed to a right angle a plaster of Paris cast is applied from the toes to the groin. This is allowed to remain on for four weeks, and is followed by a cast from the toes to the knee for an additional four weeks.

In cases presenting a very short foot, more marked varus, and a hypertrophied cuboid, the graft is taken from the posterior part of the cuboid on the outer side of the foot and inserted into the scaphoid by precisely the same technique as that carried out in the tibial wedge graft. These incisions produce a complete transverse section of the bones of the tarsus, and allow the forefoot to be not only swung outward at this point but to be rotated about the cuboscaphoid ligament.

As this ligament lies approximately equidistant from the inner border of the scaphoid and the outer border of the cuboid it is the center of a circle of which a wedge taken from the cuboid is a sector and when used to fill the gap formed by splitting the scaphoid and correcting the foot it exactly fits and at the same time the gap formed by its removal from the cuboid is closed.

The foot and limb are fixed to the groin in a plaster of Paris dressing with the foot well over-corrected and the knee flexed. This dressing should remain on for four weeks, followed by a second plaster of Paris dressing to the knee to remain on eight weeks.

THE ADVANTAGES OF THE BONE-GRAFT IN CLUB-FOOT

It lengthens the foot, already much shortened. By permanently lengthening the short side of the skeleton of the foot, it insures in a most trustworthy way against a relapse of the deformity. No joint is involved by the operation, therefore it does not cause an interference with joint function or mobility.

Acquired club-foot (paralytic varus) This type of deformity is due to unbalancing of the foot by paralysis or weakening of the peroneal muscles. The outer border of the foot drops, the forefoot adducts, and the child walks upon the outer edge of the foot, forcing it into further adduction and causing an increasing hypermobility of the astragaloscaphoid joint resulting in a deformity very



Fig. 3.



Fig. 14

similar to that of a congenital club-foot. The requirements for treatment are very similar to those of congenital club-foot, with the addition of necessity of the control of the hypermobility and dropping of the outer border of the foot.

Author's operation for paralytic club-foot (Fig. 13) The tendo Achillis is tenotomized, if shortened. The astragalo-scapoid joint is reached by a U-shaped incision and turning up of a flap of skin and subcutaneous tissues. With a sharp chisel or osteotome all the cartilage is removed from the posterior surface of the scaphoid and the head of the astragalus. The foot is over-corrected and the antero-posterior diameter of the cavity is taken between the cut bone surfaces of the scaphoid and astragalus. The wound is packed with hot saline compress. The tibia is laid bare about three inches below the tubercle of the tibia. The dimensions of the required graft are outlined by a scalpel in the periosteum. With the small motor saw cuts are made completely through the bone cortex. With the motor drill two holes are drilled through the cortex of the graft, before it is disengaged from the tibia. The transplant is then removed from its bed with a chisel and threaded upon one or two strands of kangaroo tendon the ends of which are threaded into strong cervix needles one needle is forced through the inner border of the scaphoid from the cut surface side and the other is passed through the inner surface of the head of the astragalus

from the cut surface side. The graft is pushed into position between the astragalus and the scaphoid the sutures drawn tight and tied over the graft. The periosteous tissues are drawn over the graft and sutured with chromic catgut and the skin wound is closed by continuous plain catgut suture.

If the peroneal muscles are entirely paralyzed the varus or dropping of the outer side of the foot can best be controlled by using the tendons of those paralyzed muscles for ligaments.

The peroneal tendons and external malleolus are exposed by a curved incision with its convexity posterior. An osteo-periosteal flap one inch in its vertical diameter and two-thirds of an inch in its antero-posterior diameter is turned posteriorly by a chisel on the periosteous and periosteal tissues as a hinge. The peroneal tendon sheaths are split for a considerable distance up and down from opposite the periosteal flap and the tendons are brought forward and placed beneath the osteo-periosteal flap which is sutured over them with silk. Additional silk sutures are passed through the upper and lower edges of the osseous flap through the tendons and into the periosteum and periosteous tissues of the fibula beneath the tendon.

It is important that the foot is held over-corrected and that the tendons are held taut while the sutures are placed in position (Fig. 14). The skin wound is closed by continuous

catgut sutures. With the foot held in over correction, and the knee flexed a plaster cast is applied from the toes to the groin. This plaster should be removed at the end of four weeks and be replaced by another reaching from the toes to the knee for an additional six weeks. It should be determined in individual cases whether support by braces is needed.

If it is not desirable to use the peroneal tendons for ligaments because the muscle power is not entirely lost, silk ligaments may be inserted between the tip of the external malleolus and the cuboid, to fortify the weakened muscles. This is best accomplished by short incisions over the external malleolus and cuboid, and the silk ligaments passed under the skin by tunnelling with a blunt-eyed probe or a broad ligament clamp. The ends are inserted into the bones of the external malleolus and cuboid by strong cervix needles or by drilling. As there is danger of the untying of knots of heavy silk, fine silk is tied around each half knot.

Post-operative convalescence is carried out in precisely the same manner as when the tendons are used for ligaments.

Advantages of the above method. Adduction and varus are corrected. The adduction is overcome by lengthening the inside of the foot and fixing the scaphoid opposite at anterior surface by the mechanics of a wedge.

Hypermobility is controlled and a stable foot is produced. The mechanical balance of the foot is much improved. The anterior tibial muscle, an active factor in producing the deformity is restored to its normal function. In certain cases when the anterior tibial is well developed and the peroneal muscles are paralyzed the adduction of the foot is over corrected by inserting a large wedge graft the anterior muscle is thus made to do more than its normal work by overbalancing the foot.

CONCLUSIONS

1. My experience as to the trustworthiness of the bone-graft as surgical agent, when taken with its enclosing membranes (peri-

osteum and endosteum) and contacted with bone, has been borne out by Murphy Mc Williams and others, who have obtained practically 100 per cent of successes. In my last one hundred cases the successes have been 100 per cent.

2. The endosteum, marrow substance, and periosteum should be included on the graft, as they play a most important rôle in aiding to establish an early and sufficient blood supply from the recipient tissues to the cortical part of the graft. The endosteum is also actively osteogenetic as well as the inner layer of the true periosteum.

3. A rapid and complete union between graft and recipient bone should be in many cases enhanced by the interposition of numerous small grafts in which the periosteum may be disregarded because of the easy access of blood supply to their interior osteoblasts. These coalesce with each other and also with the recipient bones and the large graft.

4. The living bone graft has certain bacteria resisting properties, as evidenced by two of my animal experimental cases where sepsis occurred and parts of each graft became united to the recipient bones, while the rest of the transplant succumbed to the infection and requested.

5. The bone-graft apparently acts always as a stimulus to osteogenesis to the bone into which it is ingrafted or contacted.

6. The bone-graft when well contacted becomes immediately adherent to the recipient bone by newly formed tissue, which changes to solid bone within four weeks time. This together with its bacteria-resisting property strongly favors, in the author's opinion, the substitution when feasible of the bone-graft in place of all metal internal splints, especially when it is appreciated that metal has the opposite effect to the graft, in that it inhibits callus formation, produces bone absorption, and favors infection.

7. The dowel, the inlay and wedge bone-graft afford a means of repairing and remodeling the skeleton which the surgeon has not hitherto possessed.

COMPOSITE OR FIBRO-EPITHELIAL TUMORS OF THE LIPS

By WALTON MARTIN, M. D. New York City

THE following case seems sufficiently unusual to make it of interest

A boy fifteen years old had noticed two years previously a small mass, about the size of pea, in his lower lip. This mass had gradually increased, so that the lip was pushed forward. There had been no pain or discomfort. He desired simply to be relieved of the deformity. The boy had always been in good health. He had no similar swellings. The teeth and mouth were normal. His family history was negative.

Examination. On examination there was found embedded in the substance of the lip near the middle line, an oval swelling with the long axis of the oval in the sagittal plane of the body about one-half inch in length and one-quarter inch in width. It was tense firm, and freely movable. The skin was tightly stretched over the little mass, and the mucosa of the mouth was less extent. It was not tender and there was no heat or redness in the surrounding areas. The portion of the tumor presenting under the skin looked whitish.

Operation. Through a small linear skin incision under cocaine anesthesia the small tumor mass was readily enucleated by blunt dissection.

Specimen. The specimen removed was an elongated tumor three-eighths inch by five eighths inch, slightly constricted in the middle. It was obviously made up of two parts, one mainly cystic the other solid. On section the two parts became even more evident. The solid portion was firm and suggested the appearance presented by the so-called mixed tumors of the parotid.

Microscopical examination. Under the microscope the tumor was seen to be enclosed in a fibrous capsule. From this capsule a strong band passed inward dividing the tumor into two parts and giving it the appearance of being constricted in the middle as seen macroscopically. Derived from the connective tissue capsule and this main connective-tissue partition secondary septa passed into its substance. In places this connective tissue changed gradually into more cellular mucoid tissue. The connective tissue framework and the mucoid tissue were moderately vascular and together made up about one-eighth of the tumor. The rest was made up of cysts of various sizes lined with columnar cuboidal and somewhat flattened epithelial cells with deep stained nuclei

arranged in layers, and of solid masses, bands, bars or strands of epithelium lying in the basement membrane. The microscopic appearance again is similar to the so-called endotheliomata or mixed tumors of the parotid.

Scattered through the medical records are reports of similar labial tumors. One was described by Sir William Lawrence in 1831. It was the size of an English walnut and contained not only cartilage, but also a small portion of bone.

In his lectures on surgical pathology Sir James Paget referred to two specimens he had had an opportunity of examining. In neither specimen was cartilage found.

Broca, in Duplay's *Surgery* in his article on labial tumors gives a good description of these new-growths under the heading of mixed tumors of the labial glands. He refers to the reports of ten cases.

Ribbert in his *Geschwülstlehre* (1904) under the heading of composite tumors of the salivary glands, describes a similar tumor that he had examined taken from the upper lip. In the *Précis de Pathologie Chirurgicale* under the heading of tumors of the lips of salivary origin an account is given of these neoplasms.

Beneath the mucosa of the lip interposed between it and the orbicularis oris is a layer made up of glands. These glands are embedded in the submucous connective tissue and are surrounded by fat. They are acinous glands provided with excretory ducts which open on the surface of the mucous membrane in the oral cavity. Recent investigation has shown that they belong apparently to the so-called mixed type of salivary glands, like the submandibular and sublingual.

New-growths arise in these labial glands just as similar tumors arise in one of the other salivary glands. Clinically they are benign. The disfigurement that they cause insures their early removal, possibly before they have an opportunity of undergoing



A 300 X. Connective tissue stroma showing cartilage elements, in upper left-hand corner. Cells undergoing mucin-like degeneration.



D 300 X. Demonstrating capsule, stroma and numerous epithelial cells.

malignant change. For it is well known that similar growths in the parotid after many years of slow growth may show signs of great malignancy and rapid growth. They are uncommon and almost all of the reported cases are of the upper lip. The situation of the growth in the lower lip described above is very unusual.



F 20 X. View of slice from entire tumor showing capsule and relative proportions of cysts to solid tissue. A and D show portions cut out for photomicrographs. (From the Laboratory of Surgical Pathology, College of Physicians and Surgeons, Columbia University.)

Without entering into a discussion of the correct classification of this interesting group of tumors (made up of epithelial cells, cartilage, bone and connective tissue) I will simply present Ribbert's views. He explains in a footnote that the heading "Composito Tumors" (Zusammengesetzte Tumoren) was a misprint; that these growths are really fibro-epithelial tumors. He groups them with fibro-adenomata of the breast. He believes that the changes into cartilage, mucoid tissue and bone are all forms of connective tissue metaplasia and that, if the tumors are carefully enough examined transitional places will be found where the connective tissue passes gradually into mucoid tissue and this into cartilage and bone. He divides them sharply from true mixed or as he prefers to call them composite tumors, such as are found in the mouth and the sacrococcygeal regions, epiglottitis, ratomata, etc. He believes that the cellular masses are epithelial, not endothelial (as held by Volkmann).

The sections of this little tumor are very interesting in reference to this point of view.

AN IMPROVED GILLIAM OPERATION FOR UTERINE DISPLACEMENTS¹

Wm. CUTHBERTSON M. D., CHICAGO

DISPLACEMENTS of the uterus may be divided into anterior and posterior displacements and descent. The anterior and posterior displacements may be subdivided into flexions and versions, and descent into the first, second and third degrees. The operation which I am about to describe is applicable to the retrodisplacements and the first and second degrees of descent.

The normal uterus is maintained in its normal position in the pelvis by the pelvic fascia and the connective tissue surrounding the blood vessels of the organ. As it appears in the normal state when the abdomen is opened it is pale pink in color of a moderately firm consistency on palpation, and lies in moderately ante-flexed position with its fundus pointing forward and upward towards the symphysis pubis. None of its ligaments are on the stretch. It is freely movable, laterally anteriorly posteriorly and upwards and downwards. After these various movements it assumes its normal position automatically.

Etiology. To produce any of the different displacements of the uterus often the first thing to occur is interference with its circulation, accompanied or not by traumatism or infection which results in an increase in its size and weight. This circulatory disturbance may be caused by first pregnancy second, infection third congestion—the first two frequently being accompanied by traumatism.

1 When normal pregnancy occurs followed by a natural delivery without any infection and a proper puerperium being maintained the uterus undergoes involution and it resumes its normal position in the pelvic cavity. When, however, infection occurs, or the uterus is badly traumatized during delivery subinvolution follows which, of course, alters the size and weight of the uterus.

2 When from any of the numerous causes, infection of the non-pregnant uterus takes

place the natural phenomena of inflammation ensue and again the size and weight of the organ are materially increased and its position in many instances abnormally altered. This deranged position may be brought about either through the increased weight alone, due to circulatory disturbance or by adhesions having formed which draw and fix the organ in its displacement, or by both combined.

3 In many virgins we have displacements of the uterus of all varieties. W. J. Mayo (1) states: We have complete records of the physical examination of many thousands of women. While the normal position of the uterus in the majority of women perhaps 75 per cent, is more nearly anterior than posterior it must be acknowledged that in at least 25 per cent and at various ages retro-position exists. The condition will be found as often in the young girl as during the child bearing period and after the menopause, and it is probable that retro-position of the uterus is even more common than these data would suggest. The anterior and especially the retrodisplacement may be brought about in the following manner. At the menstrual period the young woman may be subjected to extreme cold, a severe wetting, or a fright, which may produce a cessation of menstruation when the uterine blood vessels are full and turgid. This results, as in the causes mentioned before, in an increase in the size and weight of the organ and the local conditions are ripe for a displacement. Owing to the increased size and weight produced by the foregoing causes, one of two things happens. When displacement occurs either the fundus falls forward producing an increased ante-flexion, or the uterus straightens up owing to the increase in blood pressure, and the vertical axis of the uterus lies in the same plane as the vertical axis of the pelvis, where it is in position to begin descent. Now if the pelvic fascia and the uterine ligaments are normal, the uterus may undergo involution, and spontaneous recovery ensue. On

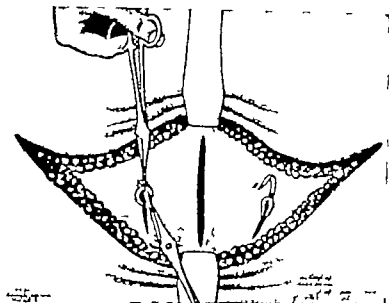


FIG.

the other hand with relaxed ligaments and fascia, any sudden increase in voluntary muscular effort, or increased intra-abdominal pressure may push the uterus over into retroversion or the first step of descent is begun.

Prolapse of the uterus is merely a hernia, and is produced by the same influences which cause herniæ in other parts of the body viz. relaxed outlets, increased internal pressure and traumatism.

In addition, Barton Cooke Hirst (2) says: "There are three injuries responsible for prolapse which must be kept in mind. First the stretching with possible actual lacerations of the fibers of the cardinal ligaments of the uterus in the bases of the broad ligaments supporting the cervix, lower uterine segment and indirectly the vaginal vault. Second the complex injury of the anterior vaginal wall, consisting in (a) an over-stretching of the longitudinal fibers of the fascial plate derived from the bases of the broad ligaments, extending downward between the bladder and the vagina (b) a lateral separation of these fibers by the eccentric pressure of the child's head in labor (c) a glacier-like movement of the vaginal wall on its subjacent attachments, tearing them loose and (d) a

laceration of the muscle and fascia of the urogenital trigonum, the only support of the lower third of the anterior vaginal wall. Third a laceration of the levator ani muscle in the posterior vaginal sulci with a certain amount of that glacier-like movement of the posterior vaginal wall noted in the anterior wall.

Symptomatology The reasons which cause a woman suffering from displacements of the uterus to consult her physician are many and varied. In marked prolapse the cause is obvious, yet it is astonishing how many women refrain from any consultation even when suffering from a marked degree of prolapse, because they are suffering no pain, but merely are inconvenienced by the uterine protrusion, and the soiling of their linen from discharges of pus and blood—the fear of an operation evidently being paramount. In a larger number of instances, however the patient complains of a bearing-down pain, and where the displacement is accompanied by a severe perineal laceration of feeling as if everything were falling out of her.

Pain in the sacral region is prominent; constipation is often a marked symptom, combined with painful defecation there is not

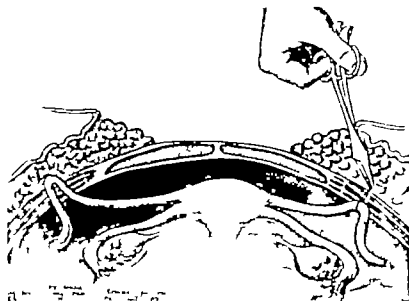


Fig.

Infrequently a dysmenorrhoea, amenorrhoea and menorrhagia and metrorrhagia may alterate while finally after more or less prolongation of any or all of the above symptoms a state of neurasthenia may have supervened. On the other hand, there are undoubtedly many cases of uterine displacements of pronounced type (excluding of course prolapse) which produce no symptoms whatever. The presence or absence of these symptoms may be explained by Crile's mechanistic theory of disease. In those women who have been subjected to oft repeated child bearing abortion, or who have indulged in excessive coitus, there is produced what Crile terms a lowered threshold by repeated stimuli to the afferent nerve tracts while in virgins masturbatory and unsatisfied sexual longings excite the nerve tracts in a similar manner and the same results obtain. This lowered threshold brings the sexual organs of the patient into undue prominence and hence any unusual disturbance draws her attention to the pathologic condition of the part and hinders relief.

Operation. I will not attempt to enumerate all the various operations which have been devised for the correction of the uterine displacements but merely draw attention to

some of the more prominent ones. The Alexander operation was one of the most widely used in the correction of these displacements, but it was applicable only to those cases which were free from adhesions and infections and where the uterus could be easily drawn forward. This operation when properly performed was one of the most successful which has been devised and could be utilized either during the child bearing period or after the menopause.

Next came the ventrofixation and ventrosuspension operations. These were absolutely bad, the first because it fixed the uterus in an abnormal position and could not be used during the child bearing period on account of its being a prolific cause of abortion as well as being responsible for many cesarean sections from the dystocia which it produced. Ventrosuspension was less objectionable as it could be performed at any period of the woman's age. Its defects were however that where only one attachment was made to the anterior abdominal wall the resulting cord was not sufficiently strong to hold the uterus in position and an elongation took place which allowed the uterus to fall back into its old condition of retroversion or descent. If two attachments were made

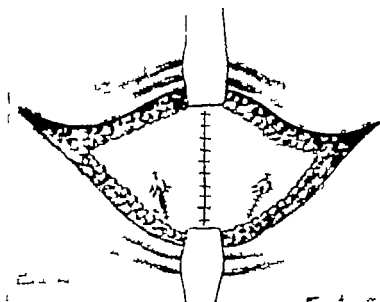


Fig. 3.

intestinal obstruction and strangulation took place in a sufficient number of cases to condemn the operation.

To my mind, any operations which involve the use of the broad ligaments, such as plicating stitching them to the posterior surface of the uterus, etc. are wrong in mechanical principle consequently they will not be mentioned. From the number of operations in which it has been utilized it would seem that the round ligament is the most useful structure by which these displacements can be corrected. Furthermore the mechanical principle which is involved in its utilization

—i.e. an upward and forward pull seems to be the most correct. That upward and forward pull is the greatest when the round ligaments are brought out through the anterior abdominal wall, rather than where they are fixed through vaginal incision, such as in the Watkins-Wertheim operation. One of the earliest and most cogent objections to the anterior abdominal wall operation was that the round ligaments could not be permanently secured in the recti muscles and the fascia. To overcome this the late Alexander Hugh Ferguson and Franklin H. Martin brought the round ligaments across the

front of the abdomen either over the aponeurosis or through a tunnel and stitched them together. This pulled the uterus up too close to the anterior wall and also put too great a strain on the ligaments, especially if they were short and poorly developed and even after this stitching they did not hold in their new position.

II. N. Vineburg (3) fastens the uterus to the anterior wall by two sutures placed around the round ligaments on either side of the uterus which are brought out through the recti muscles and fascia and tied subcutaneously. He claims good results from this operation, although he reports one case of intestinal obstruction following its use. Gilliam operation (4) in which he brings the round ligaments out through the anterior abdominal wall at the internal ring seems to me to be the nearest to anatomical perfection, in that it produces the least disturbance in position of the round ligaments, leaves no openings for the production of intestinal obstruction, and produces the greatest degree of correct mechanical pull —i.e. upwards and forwards, which is necessary to overcome the displacement under consideration. The weak point in his operation, however is the tran-

sient holding in place of the shortened ligaments, and it is this defect which I have endeavored to overcome and which I have the honor to submit for your favorable consideration.

Operation. The first step after the usual preparation of the patient is to make a Pfannenstiel incision from one internal ring to the other and after loosening the skin upwards and downwards from the subjacent fascia the abdomen is opened in the median line by as small an incision as possible through which necessary manipulations can be made (Fig 1). All uterine adhesions are broken up by the resulting bare spots are covered over by peritoneum the uterus replaced in normal position, and the round ligaments on either side caught up by rubber protected intestinal forceps. This procedure I find necessary because the round ligaments can be easily amputated by bare steel forceps. After the round ligaments are isolated a point is selected far enough from the uterus which when the ligament is shortened will hold the uterus in its normal position. In selecting this point the size of the ligaments will have to be taken into consideration—the smaller the ligament, the nearer the uterus is the point to be selected. Through this point a catgut guy suture is passed and the round ligaments drawn through the anterior abdominal wall as in the Gilliam operation (Fig 2). The next step is adapted from the operation of L. L. McArthur where he uses a live aponeurotic suture in the radical cure of hernia.

The aponeurosis of the external oblique is seized with a snub-nosed forceps and with a scalpel, a strip of the aponeurosis is peeled up from just above Poupart's ligament to a point about two cm. above where the round ligament emerges from the muscle. Next, a sharp pointed pair of Kocher's forceps is pushed through between the two arms of the ligament and catching the aponeurotic strip

it is drawn down into place again and stitched there with a continuous catgut suture (Fig 3). Interrupted catgut sutures are placed through the round ligament and fascia to hold the ligament in its new position until the strip of aponeurosis shall have grown into place. By this means the round ligament is permanently prevented from slipping or being pulled back into the abdominal cavity and the uterus is absolutely held in its normal position.

I have performed this operation fifteen times in the past two years. Twelve of the patients are still under observation in which no recurrence of the displacement has taken place. The other three have been lost sight of. Two of these women have undergone pregnancy and delivery. There was no dystocia in either case. Three of the women had prolapse of the uterus of the second degree, with torn perineum and three, associated rectocele and cystocele. In these patients plastic operations were done on the vagina.

I have found this operation to be exceedingly valuable in case of a cystocele accompanied by uterine prolapse. After an anterior colporrhaphy is done and the uterus is well drawn up and fixed, the cystocele does not recur.

In my earlier operations I found that where the genito-crural or ilio-inguinal nerves were caught in the suturing a good deal of pain persisted in the inguinal region. Subsequently I have been careful to avoid these nerves, with the happiest results.

By using the Pfannenstiel incision through the skin and the vertical through the subjacent abdominal wall plenty of room is assured to perform any necessary operations on the uterine adnexa which may be found imperative.

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THE EDUCATIONAL VALUE OF CANCER STATISTICS TO INSURANCE COMPANIES THE PUBLIC, AND THE MEDICAL PROFESSION¹

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CANCER, in its relation to life insurance presents itself in a threefold aspect first, as a problem in selection or insurance medicine second, as an element in insurance experience and third, as a question of state medicine, with a special regard to the educational value of cancer statistics and the feasibility of cancer control. The importance of the problem is set forth in the statement that the approximate mortality from cancer in the continental United States for 1913 is about 75,000 and considered by organs or parts affected the estimated mortality for 1912 was as follows:

ESTIMATED MORTALITY FROM CANCER IN THE CONTINENTAL UNITED STATES, 1912

	Both Sexes	Per Cent.
Buccal cavity	768	1.9
Stomach and liver	24,04	30.5
Peritoneum, intestines, rectum	9,37	3
Female organs of generation	9,790	5
Breast	6,286	9.7
Skin	697	3.7
Other organs and parts	307	14.8
	70,990	100

For the year 1910 the average age at death in cancer and other malignant tumors combined was 59.2 years for the registration area of the United States. For males the average age at death was 60.4 years, and for females 58.4 years. Considered by organs or parts affected, the average age at death in cancer of the buccal cavity was 63.1 years in cancer of the stomach and liver 61.2 years in cancer of the peritoneum, intestines, and rectum, 59.2 years in cancer of the female genital organs, 53.8 years in cancer of the breast, 58.3 years in cancer of the skin 68.0 years and in cancer of other organs and parts not specified, 56.9 years.

As a problem in insurance medicine cancer presents unusual difficulties to both the examining physician and the medical director. The literature of the subject extends over half

a century since practically every authority on insurance medicine has given the subject at least incidental consideration. Most of the earlier writers, beginning with Brinton in 1856 emphasize the assumed hereditary character of cancerous affections, but as early as 1857 Ward called attention to the personal aspects of the disease as made evident in "allowance or pallor of the face, the general clayey hue of the skin, and peculiar sadness of expression." Also "the anemic, chlorotic aspect of females suffering from uterine derangement." Allen, who was apparently one of the first American writers on insurance medicine, in his "Medical Examinations for Life Insurance," published in 1866, referred briefly to the subject under the general title of tumors, giving a few directions of value in medical examinations and advising unconditional rejection even in the case of non-malignant tumors as involving danger by their anatomical position or as requiring a severe surgical operation.

These views have continued to prevail among writers on cancer as a problem in medical selection for insurance, and passing over a large number of authors whose conclusions I have been at pains to bring together I would refer first to the standard treatise by Charles Lyman Greene on "Medical Examination for Life Insurance," published in 1905 in which occurs the statement that the hereditary nature of cancer is a subject of dispute but the weight of evidence is strongly in favor of a well-marked hereditary influence. Haviland Hall, in 1906 in the third edition of his "Medical Examination for Life Insurance," writes that cancer comes next to consumption in regard to frequency of hereditary transmission. Ramsey in 1908 in his "Practical Life Insurance Examinations," accepts the hereditary theory of cancer occurrence and Brockbank, in 1908 also in his work on "Life Insurance

and General Practice concludes that females show a greater tendency to inherit whatever is the condition which leads to cancer than males do and they also die from it at a younger age than their brothers would. In a general way continental authorities have accepted the same view and their conclusions are apparently sustained by the experience of the Gotha Life Insurance Company, but for a comparatively early period of time.

Few of the writers on insurance medicine have given useful advice on methods of diagnosis to disclose either an existing cancerous condition or a well-pronounced tendency to the disease. The over-emphasis given to the assumed hereditary theory has no doubt been of much harm in that it has prevented a due consideration of the non hereditary aspects of the disease when considered from a life insurance point of view. It is also quite probable that most of the writers have taken for granted a general conformity on the part of the examining physician to accept and act upon the prevailing theories in medical diagnosis, direct and differential which it goes without saying has made considerable progress during recent years. This conclusion applies not only to cancers in general but particularly to gastric ulcers and their complications, to cancer of the stomach and, in the case of women to cancer of the breast. The cancer experience of life insurance companies cannot be fully reviewed on this occasion. The published data are of considerable scientific interest and well deserving of a qualified and thorough analysis. They date back over more than a century and illustrate the advance of medical science as much as they sustain the conclusion that there has been an actual increase in the cancer death rate.

A large amount of statistical information on the subject of cancer is available for American and foreign insurance companies but the available data can only be very briefly referred to. The experience of the Germania of Stettin, published in 89, sustains the Gotha experience as regard the value of medical selection in reducing the mortality from cancer during the earlier

years of insurance. Considering the two periods of a duration of five years or less and six years or more it appears that the actual mortality of males per 1,000 at ages 31-40 was 0.21 and 0.32 respectively; at ages 41-50 it was 0.67 and 1.14; at ages 51-60 it was 1.97 and 2.87; and at ages 61 and over it was 4.63 and 6.64. The results for females are about the same. The cancer death rate for males was 1.33 per 1,000 and for females, 1.90. The experience covers the period 1857-94. It may be stated in this connection that for women only the death rate from cancer during the period 1857-82 was 1.38 per 1,000 whereas for the entire period, 1857-94 it was 1.90. There had therefore, been a not inconsiderable increase in the cancer mortality during the later years but to be entirely conclusive, the experience should have been extended to insurance durations and divisional periods of life.

In the experience of the Austrian Phoenix, the proportionate mortality from cancer has increased from 8.5 per cent during the five years ending with 1906 to 10.4 per cent during the five years ending with 1912. In the experience of the Rionione Adriatica di Sicurtà of Trieste the proportionate mortality from cancer has increased from 9.3 per cent during the seven years ending with 1905 to 8.0 per cent during the seven years ending with 1912. In the experience of the Leipziger which is one of the largest German life insurance companies, the percentage of deaths from cancer has increased from 11.8 during the ten years ending with 1902 to 12.6 per cent during the ten years ending with 1912. In the experience of a large Hungarian company however — the Foncitére — the proportionate mortality from cancer has slowly declined from 8.6 per cent during the five years ending with 1905 to 8.0 per cent during the five years ending with 1911. In the experience of the Assicurazioni Generali, the largest Austrian company the proportionate mortality from cancer was 9.2 per cent during 1899-1905 against 9.5 per cent during 1906-12. The experience of many other foreign companies could have been quoted to sustain the conclusion that in most cases the proportionate mortality from cancer has increased

during recent years and that in any event the mortality from malignant disease is of more importance to life insurance companies than has generally been assumed to be the case.

The most recent American investigations tend to confirm this point of view. In 1903 the combined experience of thirty four American life insurance companies was published by the Actuarial Society of America. It was brought out with reference to persons who had a family history of cancer that the subsequent experience had been very good with young entrants, almost equally good with mature entrants, fairly good with elderly entrants, but not good with old entrants, but the actual number of the latter was hardly sufficient for a final adverse conclusion.

The most recent investigation is for the period 1885-1908. The number of deaths of males at ages 15-29 was 4,566 of which 95 were from cancer and other malignant tumors, or 2.1 per cent. The mortality rate was 1.0 per 10,000 at ages 30-44, the total number of deaths was 7,836 of which 377 were from cancer or 4.8 per cent of the mortality from all causes, or 3.2 per 10,000 exposed to risk. At ages 45 and over there were 5,340 deaths, of which 411 were from cancer or 7.7 per cent of the mortality from all causes, or 14.4 per 10,000 exposed to risk.

The same experience has been made up regarding women applicants. At ages 15-29 the number of deaths from all causes among insured women was 3,696 of which 98 or 2.7 per cent were deaths from cancer or 1.4 per 10,000 exposed to risk. At ages 30-44 there were 5,661 deaths from all causes, of which 668 or 11.8 per cent, were deaths from cancer equivalent to a rate of 7.3 per 10,000 exposed to risk. At ages 45 and over there were 4,917 deaths from all causes, of which 654, or 13.3 per cent were deaths from cancer or 24.3 per 10,000 exposed to risk.

The medico-actuarial investigation considered also the relation of build at entry to causes of death, with distinction of three distictional periods of life. Dividing the applicants into three classes—that is, overweights or those whose weight at entry was 50 lbs. and more and standard lives, or those who were of normal weight and underweights

who weighed 25 lbs. or more below the standard—the experience with reference to cancer was as follows: at ages 15-29 the cancer death rate of overweights was 0.9 per 10,000, and of underweights 0.8. At ages 30-44 the cancer mortality of overweights was 3.7 per 10,000 and of underweights, 2.4. At ages 45 and over the cancer mortality of overweights was 15.6 and of underweights 12.0 per 10,000 exposed to risk. The experience, therefore, conclusively sustains the view occasionally expressed by writers on the subject of cancer occurrence, that the disease is more common among persons of overweight than among underweights, and, by inference, among the well-to-do and over nourished, than among the less prosperous element but of more normal physique. The medico-actuarial evidence is of exceptional value in that it confirms this conclusion for three periods of life on the basis of what may safely be considered to have been a sufficient exposure.

Some very interesting facts regarding cancer as disclosed by the experience of a large and representative life insurance company were first exhibited by The Prudential Insurance Company of America in connection with an exhibit made at the Louisiana Purchase Exposition in 1904. The information has been brought down to date for the present purpose and the results seem to sustain the conclusion that the proportionate mortality from cancer is distinctly less among industrial risks, representative of the wage-earning element, and distinctly higher among ordinary risks, regardless of a more rigid medical examination but representative of the more prosperous and well-to-do. Considering only the age period 40-59 it appears that for males the proportionate mortality from cancer in the company's ordinary experience was 6.7 per cent against 5.10 per cent in the industrial experience. For females, the corresponding proportions were 18.5 per cent in the ordinary experience and 13.7 per cent in the industrial. Throughout the proportionate mortality from cancer was very much higher among insured women than among insured men. Selecting for illustration, the age period 50-54 it appears that in the industrial experience of The Prudential

the proportion of deaths from cancer at this period of life was 5.76 per cent for males, against 15.31 per cent for females. In the ordinary experience the corresponding proportions were 8.1 per cent for males and 18.3 per cent for females. It is quite probable that the value of medical selection with particular reference to cancer is distinctly less in the case of insured women than of insured men but in view of the facts disclosed by the medico-actuarial investigation, that there is a distinct value in the medical selection with reference to cancer as shown by the reduced mortality from this disease during the early years of policy duration, it would seem entirely safe to conclude that the proportionate mortality from cancer is distinctly higher among the prosperous and well-to-do than among the wage-earning element, including the less prosperous and the poor.

The foregoing observations and conclusions touch only the fringe of a vast problem of the greatest possible importance to the public: the life insurance companies which are engaged in the business of assuming risks conditioned by the duration of life and the medical and surgical profession, but for whose combined efforts and relatively high degree of professional efficiency the mortality from malignant disease would be much greater than is actually the case. The time has come for concerted action in the direction of educating the public at large in the earliest possible symptoms of even pre-cancerous conditions, or predisposing states of the tissues, on the one hand and the efficacy of the earliest possible operative treatment on the other. The public requires to be made familiar with the accepted facts of surgical experience which, for illustration in the case of operations for cancer of the breast show a reduction in the primary mortality from 25 per cent in pre-anesthetic days to less than 1 per cent at the present time and a further reduction according to Deaver in the probability of local recurrence from 65.6 per cent to only 6.5 per cent. The initial symptoms require to be treated on the part of the public with more seriousness than is usually the case and also the advisability of the earliest possible qualified medical and surgical treatment as an

essential prerequisite for the obtaining of a cure, or at least a material prolongation of life. It is far better to overrate the seriousness of even apparently non-malignant tumors than to underrate the terrible possibilities of ultimate changes or degeneration from benign into malignant tumors. Even the occurrence of warts and pigmented moles requires to be looked upon as a possibly pre-cancerous condition and certainly every lump in the breast, or continuous local pain, should suggest the possibility of malignant disease. In the case of cancer of the uterus there can no longer be a question of doubt but that permanently successful results are obtained by the earliest possible operative treatment, but that even a comparatively short delay is frequently followed by fatal results. The many excellent suggestions which have been advanced by Winter of Koenigsburg and those who have followed his teachings are bound, in the course of time to result in a material reduction in the now excessive mortality from this most terrible affliction. The mortality from practically all other forms of cancer can be reduced by operative treatment provided on the one hand, the cases are brought early to the attention of qualified surgeons, and on the other that medical practitioners improve in methods of diagnosis and with all the power at their command urge against fatuous reliance upon other than surgical methods of ultimate treatment.

As a further step in qualified and practical cancer research the experience of American surgeons and American hospitals should be brought together in a convenient form and subjected to critical analysis, for the purpose of disclosing the lessons of the actual experience and the changes and results under past and present methods of operative treatment. The literature of cancer is now so enormous that it defies the understanding of any one mind in even a single specialized direction chiefly on account of the want of really trustworthy data on any and all important phases of the cancer problem in its relation to the medical and surgical profession, the life insurance companies, the public, and the State. It would therefore seem eminently proper and fitting for the Clinical Congress

is considerably more Wharton's jelly than is usually found and the cord has the feel of being waterlogged. About 25 cm. from the umbilicus is a constriction composed of two firm bands of tissue that have knotted together. These bands or small ropes are composed of shredded amniotic membrane rolled up to be very resistant to considerable strain. They can, however, be readily unrolled.

The constriction of the cord is so firm that not only is all the circulation shut off but even the Wharton's jelly in that region is also pushed aside.

In this case it is seen that the amnion was ruptured and was represented only by a fringe around the placental insertion of the cord. To substantiate the statement that it is a recent rupture and not one occurring early in pregnancy we find that the fringe is not retracted or shrunken, that there are no adhesions between it and the fetus, that there are no malformations of the fetus and lastly that the chorion is not thickened and is not firmly adherent to the lining of the uterus. I say that the chorion is not thickened or adherent because in cases reported by Lebedeff where the amniotic membrane is absent, there is an inflammation of the chorion which he attributes to the presence of the extrinsic products of the fetus.

The main issue of my case is, of course, the condition that directly caused the death of the fetus. The cause was constriction of the cord cutting off fetal circulation by two bands of recently torn amniotic membrane. In this case the amnion undoubtedly ruptured under the strain put upon it by the condition present, namely, hydramnios. After the tear had occurred the amniotic fluid dissected the amnion from the chorion, and allowed the former to float free in the sac. The movements of the fetus soon tore this into shreds which rolled up to form membranous ropes in the form of loops around the child the fixed end of the loop necessarily being at the insertion of the cord into the placenta. From the findings it seems probable that the whole free floating portion of the amnion was twisted into two such ropes which happened to cross where they both

passed by the umbilical cord. In this way the movements of the fetus managed to tie a knot in the bands around the cord. The fact that both ends of these bands were anchored made every movement of the fetus draw the knot firmer and as partial asphyxia set in the movements becoming more violent and the ropes holding the cord was totally constricted and death of the fetus resulted from asphyxia.

It is interesting to note that in the literature on this subject I have been unable to find a single case cited where *hydramnios* had caused a late rupture of the amnion which in turn constricted the cord and so caused the death of the fetus. Friedrich Ahlfeld however says "Any case of *hydramnios* predisposes to pathological conditions of the mother or child. Chlari says 'Viewed from the standpoint of pathological anatomy it is not impossible that malformations and even death of the fetus may result from an abnormally spacious amnion, or from a premature collection of amniotic fluid. Yet actual observations have not been made to substantiate this opinion.'" As regards this statement it is interesting to note, in passing that Ahlfeld reports a case of club-foot occurring in a fetus where a condition of *hydramnios* was present complicating a twin pregnancy. Bursial found four deformities in 133 cases of *hydramnios* but no adhesions.

I should like to quote fully the following case by Lvoff reported in 1898, which has not yet been translated from the Russian. It is a case in which death of the fetus was caused by constriction of the cord on account of being caught in the loop of an amniotic band but in his case the amnion was intact. His case was as follows:

I was called on a case on account of malposition, VI-pars. Pregnancy as normal with labor 1 term. Fetus was still during pregnancy and fetal movements are obtained 12 hours after labor began, then they ceased.

Examination revealed the fetus lying in the transverse position membranes not ruptured but bulging. Fetus lay high up and no heart tones could be heard.

Vernix was hastily performed. The sac as ruptured near the placental margin, releasing mœconium stained water. The child was born dead and its color as cyanotic.

The cord was of the average length with no irregularities. Looking for the cause of death in the placenta and membranes it was found that death was caused by a tightly drawn loop formed of an amniotic thread, constricting the cord at a distance of one-third its length from the fetus.

This amniotic band originated at the insert of the cord into the placenta from which point it extended parallel to the cord free through the amniotic fluid, to where it looped around the cord. From here it passed, free again to its attachment on the lining of the amniotic sac where was the rent through which the version had been done. The amnion was found to be intact normally developed and everywhere adherent to the chorion.

In conclusion I wish to thank Dr I J Franklin for the necessary aid he gave me in translating Lvoff's article from the Russian. In fact, it was really the first reference I found that shed any light at all on the work in hand.

From a careful review of all the literature on this subject I could find I was able to obtain only one case that is similar to mine and that is reported by C. Braun. In his case the amnion ruptured late and shreds of this ruptured membrane constricted the cord and caused death eight days before the onset of labor. Lvoff's case was somewhat similar as the cord was constricted by an amniotic band but the etiological factor was altogether different for in Lvoff's case the amnion did not rupture.

The rupture of the amnion was undoubtedly due to over-distention from the condition of hydramnios present and thus another possible complication may be added as a result of this condition of over-distention.

A sudden increase in the activity of the fetus in the latter part of pregnancy should

lead one to suspect compression of the cord from some cause threatening the life of the fetus. This fact is emphasized by Jones in a case in which circulation was cut off by looping of the funis around the legs of the fetus two months before term.

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CLINICAL AND EXPERIMENTAL RESULTS OF STREPTOCOCCIC INFECTIONS WITH SPECIAL REFERENCE TO ARTHRITIS AND ITS TREATMENT¹

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THE purpose of this paper is to discuss certain clinical and experimental data associated with streptococcic infections with special reference to their localization in joints and their treatment.

Streptococcal infections with the clinical manifestations of septicæmia originating from a puerperal infection, a post mortem wound or by inoculation of an abrasion of the skin or mucosa have been recognized for a long time. However the so called cryptogenetic and epidemic forms have been less thoroughly studied. I believe the term "cryptogenetic" should be abandoned inasmuch as it is highly probable that some micro-coccal lesion of the skin or mucosa is the atrium of infection when no gross change is found.

Streptococci may reach the blood through tonsils showing little or no pathological change on superficial examination. It is a significant fact however that cultures and smear taken from the surface of tonsil may bear no relation to the organism recovered from the crypts or cut surfaces of the same organs.

Fischer² has noted in children enteritis following the ingestion of milk infected with streptococci and in this manner the body is invaded by the germs. It is also possible that streptococci entering the gastro-intestinal canal with milk or food may pass through the normal lumen of the bowel into the lymphatics and then into the thoracic duct into the blood as it has been shown experimentally that tubercle bacilli fed to dogs reach the blood-current through the same route. Abrasions or operative wounds of the upper respiratory passages or oral cavity permit direct inoculation of the blood or lymphatics.

Acute and chronic lesions of the joints, heart, and kidneys are frequently associated with streptococcic throat infections. I a

series of 28 cases of chronic arthritis associated with tonsillitis, Davis recovered hemolytic streptococci from the crypts of the tonsils and there was reason to believe that these organisms were causally related to the joint lesions. These streptococci readily produced arthritis in rabbits when given intravenously and Dr. Jackson in a paper recently published explains the localization of these experimental streptococcic infections in the joints upon anatomic ground. It would appear from her results that the organism through an embolic process in the minute subarticular capillaries invades early the joint cavities directly. Endocarditis, as well as arthritis was also produced by the streptococci in a number of instances.

As bearing upon this subject I may refer to some clinical data which have come under my personal observation. It

Mrs. L. H. had repeated attacks of acute tonsillitis and arthritis finally terminating in endocarditis. The tonsils were removed during the illness as they were greatly hypertrophied and showed acute inflammation. Cultures and smears from the surface of the tonsil showed only pneumococci and staphylococci, while cultures and smears from the cut surface of crypts showed pure growths of streptococci. A section of large rabbit intestine, 4 hours culture suspended in salt solution showed the death of the animal in 24 hours. Intravenous injection of the organism were not made.

M. J. in February submitted to rhinotomy resection of deflected nasal septum. Considerable hemorrhage occurred and the area was tightly packed with gauze. One week later the patient had severe rigors with temperature of 102° and rapid pulse. The packing was removed from the nares permitting the escape of considerable quantity of dirty dark fluid. On the following day the right knee became red, tender and swollen, and movement of the joint was extremely painful. On the next day the right knee showed unusual character of the rapid pulse, dressing sweats and unusual movement of the larger joints, so that it was impossible to impose the Marked atrophy of the muscles of the arm, especially of the interosseus. At this moment at the base of the heart appeared one week after the initial chill

¹Read before the Johns Hopkins Clinic
 November 1, 1906.
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Cultures made from the blood were negative, but the streptococcus was found in pure culture in the throat. Acute suppurative otitis media occurred early in the disease. Paracentesis relieved the symptoms and permitted a free discharge of pus. At the end of the second week a massive generalized furunculosis occurred. The furuncles contained staphylococci and cleared up with vaccine treatment.

Partial recovery with deformities of most of the large joints associated with limitation of motion and muscular atrophy followed. As a result of the endocarditis, mitral incompetency exists at present. Medication in this case including the use of antistreptococcic serum and phylacogen, was of no avail. The disease apparently ran a self limited course. No injections or aspirations of the joints were undertaken no was extension by means of a weight and pulley used.

These two cases serve to illustrate how infection with the streptococcus may take place both through the nasal mucosa and through the tonsils. The marked wasting of the muscles in this case is a striking illustration of the rapid muscular degeneration both of the striped and unstriped tissues as a result of the absorption of toxic material.

Many methods have been advanced for the treatment of acute joint infections. These may be briefly classified as follows:

(a) Local : 1 Medical treatment. This includes rest of the affected joint application of heat or cold, application of drugs or poultices, and bandaging. 2 Surgical treatment. This embraces, immobilization of the part by casts or splints, Bier's hyperemia, aspiration of the fluid content of the joint cavity and injection of drugs extension by weight and pulley incision and drainage and irrigation.

(b) General treatment consists of the administration of various drugs sera, and vaccines.

Spitzer endorses the use of Bier's hyperemia, compression and the use of hot air in the treatment of all forms of infectious arthritis whether polyarticular or monoarticular. Inasmuch as drug and mechanical treatments are notoriously uncertain and the anti streptococcic serum is more often a failure than a success, he believes that the ultimate successful treatment will be by means of a polyvalent serum.

Mendel and numerous others have used subcutaneous injections in acute infective arthritis. Jackson used intra articular injections of a solution of magnesium sulphate in acute arthritis without good results.

Porter has discontinued the use of intra articular injections of formalin in olive oil or iodoform emulsion in chronic joint infections and reports good results with their use only when the arthritis is acute and confined to the synovial membrane. Murphy strongly endorses the use of two per cent formalin in glycerin in all forms of joint infections and extends the application to infections of the pleura.

This solution of formalin appears to cause no serious results even when injected intravenously in a quantity as high as 10 ccm. Three years ago the writer injected a series of dogs of various sizes intravenously with varying amounts of this solution and was never able to observe any harmful effects upon the animals.

Capps and Lewis found intrapleural injections of two per cent formalin in glycerin in dogs rapidly fatal when injected into an empyema which had been produced experimentally.

As a result of the above mentioned cases together with several other streptococcic infections it was decided to investigate the matter from the experimental side with a view of determining the effect of the injection of certain substances into and about the joints of animals. Therefore a number of rabbits were inoculated intravenously with 24 hour cultures of arthritis producing streptococci suspended in normal salt solution. The strain of streptococcus used was recovered from the crypts of tonsils removed from a patient suffering with chronic infective arthritis.

A medium-sized rabbit was used. The joints of both legs on the right side (elbow, wrist, knee, ankle) were injected with a solution of two per cent formalin in glycerin. Simultaneously an intravenous injection of

Mendel, *Bacteriology in Rheumatism*, Therap. Monatshefte 1904, 14.
Jackson, *Injections Magnesium Sulphate for Acute Articular Rheumatism*, N. Y. M. J. 1911, 32: 171.

Porter, John L. Surg. Gynec. & Obst. 913, March.
Capps & Lewis, Arch.

clinical and post mortem findings were most exaggerated in the joints injected with the iodoform emulsion as compared with the joints not so treated.

Pure cultures of streptococci were recovered from each of the joints previously injected with iodoform emulsion, as well as from the joints not so treated.

As it was evident from the results obtained in the formalin and iodoform-injected joints that neither of these substances protected the joint against the streptococcic infection it was decided to attempt to protect the entire animal by intravenous injections of a solution of sodium salicylate in water at the time of the intravenous inoculation of the streptococcus.

In a careful search of the literature no record could be found of the intravenous injection of sodium solution. However solutions of sodium salicylate in from 10 to 20 per cent strength have been given clinically by the subcutaneous method. To obtain any results several injections must be made daily, thus necessitating the use of cocaine or of some other local anæsthetic, a procedure which however is exceedingly painful and prone to produce localized abscesses. The tendency to furunculosis in patients suffering from acute articular rheumatism as a result of the drenching sweat is well known hence the liability to abscess formation would be all the greater if repeated injections of salicylate solutions were given. Mendel reports favorable results following the injection of an 18 per cent sodium salicylate solution into chronic rheumatic joints.

The following experiment was therefore undertaken with the idea of determining the influence of intravenous injection of sodium salicylate upon rabbit inoculated intravenously with arthritis-producing streptococci.

A medium sized rabbit was injected intravenously with a 24 hour culture of streptococci suspended in salt solution. Simultaneously an intravenous injection of 1 gm. of a 25 per cent aqueous solution of sodium salicylate was made. At the same time a control experiment medium sized black rabbit was given a similar injection of streptococci but without the injection of the solution of

sodium salicylate. Two days later a marked stiffness was noted in the black rabbit, which had not received the sodium salicylate injection while the white one appeared much more active and was reinjected with 1 gm. of a 25 per cent solution of sodium salicylate intravenously. One week later both animals developed multiple pus infections in their joints and died. Cultures and smears from the joints showed streptococci.

In the rabbits used in the above experiments no rigors were noticed. The animals frequently appeared sick and apathetic after 12 hours. Movement of the legs was painful and the animals crouched down in their cages with their joints flexed. In from 24 to 36 hours in many cases, painful fluctuating swellings of the larger joints were observed and these swellings persisted until death. Unlike the clinical picture of acute articular rheumatism there was not the fugitive involvement of the joints but rather a more or less simultaneous attack on all the larger joints and none of the joint so attacked showed any tendency to heal. No bony ankylosis occurred but as the animals died in so short a time it is impossible to say whether ankylosis might not have occurred later.

All the animals became rapidly emaciated and presented the appearance of a severe acute intoxication and although some of them lived as long as two weeks all finally died of a streptococcic septicæmia.

Davis has been able to regulate the dose in such a manner that he has succeeded in producing multiple suppurative arthritis without causing the death of the animal. In his series of animals many of the articular lesions subsided and the animals recovered without any clinical evidence of permanent changes in the joint while in others the arthritis became chronic causing destruction of the articular surfaces of the bones and the periarticular soft tissues. In four of his animals joint changes occurred simulating arthritis deformans but after several months the enlargement entirely subsided.

SUMMARY

In each animal multiple suppurative arthritis developed in from 24 to 72 hours

depending upon the amount of streptococci infected and thus occurred regardless of whether attempts had been made to protect certain joints by injections of different solutions or to protect the entire animal by intravenous injections of sodium salicylate.

2 Swelling and stiffness of the larger joints were noticed after 24 to 48 hours in all cases.

3 Post mortem thick purulent material was found in the joints which could be scraped away leaving the synovial membrane dull and lusterless.

4 Destruction of articular surfaces of bones ligaments, and cartilages may occur when the animals do not succumb too early to streptococcal septicemia.

5 Cultures from the heart's blood and from the pus from joints in the animals used gave pure cultures of streptococci.

6. The greatest pathologic changes occurred in those joints in which attempts had been made to protect them by injections of formalin or iodoform.

7 Intravenous or intra-articular injections of sodium salicylate in solutions as strong as 25 per cent have no permanent effect upon streptococcal arthritis.

8. Intra-articular injections of solutions of formalin in glycerin or iodoform emulsion do not protect the joints so treated.

9. Aspiration of the pus and injection of antiseptic solutions after infection of a joint had taken place did not give favorable re-

sults in the animals injected intravenously with streptococci.

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THE RÖNTGEN FINDINGS IN GASTRIC AND DUODENAL ULCER¹

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IN attempting to summarize our present knowledge of the X-ray method in studying gastric and duodenal ulcers

I recognize that new facts are being developed daily in this newest of the accessory means of clinical study of the alimentary tract. The present-day scarcity of textbooks in röntgenology is easily explained when one considers the rapid advances being made from year to year and even from month to month. This is especially true in relation to the gastrointestinal tract. This field of röntgenologic study still remains, in a large measure, virgin soil. There must yet be large series of cases studied by the röntgen ray and checked up rigidly by the findings of the surgeon and the pathologist.

Gastro-intestinal röntgenology is in its infancy and needs all the help to be derived from other departments of clinical research. The child's mistakes do not negative his potential worth as a man. An attitude of helpful and friendly critical suggestions will surely serve best in considering the value of this means of clinical study.

The röntgen evidences of ulcer of the stomach and duodenum may be classified under the following heads:

1. Bismuth flecks representing ulcer craters filled with bismuth.
2. Filling defects in the stomach shadow.
3. Organic deformities of the stomach other than filling defects. These anatomic phenomena constitute what may be called the *definite* X-ray evidences of ulcer.
- Under the head of *inferential evidence* may be classified:
 4. Spastic manifestations.
 5. Abnormalities of peristaltic waves.
 6. Abnormal emptying time of the stomach.
 7. Unusual filling of the duodenum.
 8. Pressure pain points.

These evidences will be considered in the order named.

Bismuth flecks representing ulcer craters filled with bismuth. The first suggestion with relation to gastric ulcer heard from one unfamiliar with X-ray examinations of the alimentary tract is that the crater of the ulcer should accumulate bismuth and thus cast a shadow visible on the screen or röntgenogram. In other words, it is the popular idea that the ulcer itself should show. As a matter of fact, however, experience has shown that it is rare indeed for an ulcer to show in this manner. Aside from the penetrating ulcers at about the middle of the lesser curvature, I have had only eight or ten proven cases (by operation) in which the crater filled with bismuth and several of these were so near perforation that after exposing the stomach and before proceeding to the necessary surgical procedure the surgeon felt obliged to reinforce the tissues at the site of the ulcer to prevent possible rupture during manipulation. Aside from these penetrating ulcers on the lesser curvature, and ulcers of the duodenum, I have encountered only four cases where the bismuth fleck in the stomach corresponded to a gastric ulcer.

Penetrating ulcers of the lesser curvature the X-ray findings in which were first described by Haudek, will be considered under another head.

Flecks in the duodenum representing flecks in the crater of an ulcer may be confused with a number of shadows, as for instance, bismuth flecks in the ampulla of Vater. This bismuth fleck is not easily demonstrated as being in the ampulla unless one manages to fill the duodenum at the same time the ampulla is made to show. I have a few such cases. Dr. L. G. Cole has also called attention to this source of error. Other confusing shadows which may be mistaken for the ulcer crater filled with bismuth are right renal calculi, small gall-stones and bismuth residues in the gall bladder following cholecystenterostomy. I know of at least one case in which bismuth was found in the

gall-bladder following spontaneous cholecystenterostomy. Normally a small portion of bismuth persists in the first portion of the duodenum the duodenal bulb for some time after the stomach is completely emptied.

Filling defects in the stomach shadow. Defective filling of the stomach with the resulting defective shadow is most characteristic of carcinomatous invasion of the stomach, but it may also be seen in connection with inflammatory masses attending gastric ulcer. Defects in the duodenal bulb constitute one of the chief roentgenographic means of recognition of duodenal ulcer and its complication.

Filling defect on the lesser curvature are to be differentiated from carcinoma and rarely from myxomas and tuberculous. I do not know of any way to differentiate from the X-ray findings alone between the defect caused by a small carcinoma and that caused by a callous ulcer (Fig 11). The surgeon himself is sometimes unable to differentiate when he has the lesion between his fingers.

I am able to report and show the slides of a case of tuberculous ulceration of the stomach. This ulcer occurred on the greater curvature at the junction of the middle and lower thirds, measuring about two and a half inches by an inch and a half.

Instead of producing a filling defect lesser curvature ulcers as a matter of fact may produce a projection from the stomach shadow. The size of the projection may vary from the scarcely discernible nodule upon the stomach shadow to a typical penetrating ulcer of the type described roentgenologically by Haudek.

Defects in the shadow of the duodenal bulb are rather common. Their discovery by means of the roentgen ray has been popularized by Cole in this country and later by George and Gerber. According to Moynihan 95 per cent of duodenal ulcers occur in the first part of the duodenum the so-called bulbous duodenum. The normal shadow of the duodenal bulb has been carefully studied by Cole and others and slight variations from the normal are easily recognized. Abnormal shadow of the duodenal bulb the so-called patulous entrance of Cole, may result from penetration or perforation of a chronic ulcer distal constriction stenosis, pressure upon the duodenal

bulb of extra-duodenal tumors, adhesions resulting from gall bladder or pancreatic disease. Occasionally sacculations of the duodenal bulb may be demonstrated. Filling defects in the duodenal shadow to be interpreted as ulcer should be differentiated from the normal defects due to the hepatoduodenal ligament and the deformities of the bulb due to extraduodenal pressure, as, for instance, gall bladder blood vessels second portion of the duodenum, etc. The defects due to gall bladder region adhesions are very characteristic the defect occurs on the gall bladder side of the duodenal bulb shadow but the bulb is otherwise anatomically normal.

Complete or nearly complete absence of the duodenal bulb is frequently seen in duodenal ulcer with extensive periduodenal adhesions. In carcinoma of the pancreas with extensive adhesions of the duodenum, and more frequently in pyloric or juxtapyloric ulcer with stenosis. In these cases the stomach presents an appearance to which the term "promethian" has been applied by Cole the distention of the stomach occurring mostly in the pyloric portion and presenting a very characteristic appearance.

George quotes Moynihan as stating that a duodenal ulcer which has been the cause of protracted and recurrent symptoms is always visible from the outside of the intestine, is always palpable and therefore is always demonstrable and adds to this the statement that there can be no exceptions.

While I place considerable dependence upon the deformity of the bismuth shadow in the demonstration of duodenal lesions, I am not content to rest the case upon this evidence alone. Other evidences such as hyperperistalsis, hypertonicity, hypermotility or early pyloric inactivity with later pyloric spasm and delayed emptying are some of the other signs that ought to be demonstrated in duodenal ulcer.

Organic deformities of the stomach other than filling defect. Under this head I especially wish to discuss the organic hour glass deformities and the sacculations of the stomach often attending penetrating ulcer on the lesser curvature. Also related aside from cases of penetrating ulcer one rarely finds a bil-



Fig. 1. Bismuth fleck (at arrows) seen six hours after bismuth meal, marking the crater of an ulcer near penetration.

mouth fleck which can be proven to be a bismuth accumulation in the crater of an ulcer. Penetrating ulcers on the lesser curvature frequently produce characteristic deformities which are roentgenographically demonstrable according to the extent of penetration. The projecting bismuth shadow may vary from a small outcropping from the stomach shadow scarcely discernible on the screen, to a large bismuth mass ten or fifteen centimeters in length and half as wide. Whether the projecting bismuth shadow or diverticulum has formed posteriorly in connection with adhesions and fixation to the pancreas, or anteriorly with adhesions to the liver is easily observed by careful screen examination, turning the patient this way and that until by proper oblique illumination the location and extent of the perforation may be determined. The projecting shadow will be found to move up and down during respiration when the perforation is anterior in connection with the liver but it will be immovable during

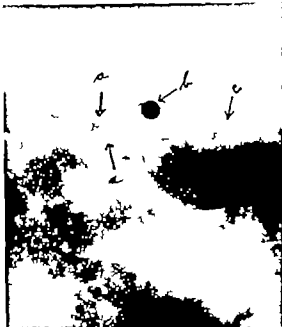


Fig. 2. Bismuth residue six hours after meal in case of penetrating ulcer of the duodenum, (a) bismuth fleck in crater of ulcer (b) air di marker (c) six-hour residue. Roentgenograms made with patient standing.

respiration when the perforation and fixation have occurred in relation to the pancreas.

Pengastic adhesions distorting the stomach and interfering with gastric peristalsis are likely to occur and are responsible, in part, for the hour-glass appearance often seen in these cases. This hour-glass deformity is usually partly spastic and partly organic—the spasm being due to gastric ulcer the organic changes being due to the pengastic adhesions. These adhesions frequently fix the stomach and often extensively involve the neighboring organs. Many times the inflammatory mass attending perforated ulcer may be definitely felt and when palpated under the fluorescent screen examination may be definitely identified as belonging to the stomach shadow. In the typical penetrating ulcer Haudek, Faulhaber and others have described above the projecting bismuth shadow a small collection of gas which has the same relation to the small diverticulum as the “magenblase” or stomach bubble has to the stomach itself. This small collection



Fig. 3. Röntgenogram made twenty-eight hours after bismuth meal showing bismuth shadow in the gall-bladder region, proves to be bismuth in the gall-bladder having passed through the cholecystenterostomy opening.

of gas lying above the localized bismuth shadow in connection with the ulcer has in fact been termed the "little magenblase."

The presence of this extra shadow with a tumor mass having an evident connection with the stomach speaks for ulcer rather than carcinoma, especially when there is no encroachment upon the shadow of the stomach with the resulting filling defect characteristic of carcinoma. When the patient is examined in the erect position, it is frequently possible to demonstrate above the localized addition to the gastric shadow the superimposed air bubble above described which definitely marks the case as one of penetrating ulcer of the stomach.

The hour-glass formation, partly organic and partly spastic, frequently associated with ulcer on the lesser curvature differs from the appearance seen in carcinomatous hour-glass stomach. In differentiating the ulcer from the carcinomatous condition, it may be stated that in hour-glass stomach due to ulcer there

is frequently a residue of the bismuth meal after the sixth hour the stoma between the upper and lower sacs lies along the lesser curvature, the outline of the greater curvature being drawn over toward the lesser; the narrowing occurs at one distinct point and the canal is usually short. On the other hand in carcinomatous hour-glass stomach, the narrow channel connecting the two sacs lies in the stomach axis and is much longer and there is usually pyloric insufficiency.

Dilatation of the stomach of varying grades is a frequent finding in chronic gastric and duodenal ulcer. The so-called prognathian dilatation associated with stenosing pyloric ulcer has already been referred to. Marked gastric stasis without dilatation is suggestive of a malignant obstruction.

Spastic manifestations. A spastic indrawing on the greater curvature producing a sharply outlined localized indentation of the gastric wall, according to the early writers, was evidence of ulcer. It was at first stated that this spasm of the circular muscles of the stomach, which were in reality a deep tonic



Fig. 4. Bismuth-filled stomach and duodenum, the entire duodenum shown. The arrows point to bismuth seen within the curve of the duodenum. Repeated observations seemed to prove conclusively that this was ulcer, not to exclude of ulcer. (Röntgenogram kindly loaned by — G. Cole.)

constriction, was characteristic of lesions of the mucous membrane at the level of any given muscular ring. It was discovered however that these spastic disturbances were sometimes purely functional. At any rate in many cases there was no discernible ulcer to be found. It was early admitted that these spastic indrawings might be seen in tabes and hysteria as well as in gastric ulcer located on the lesser curvature at the level of the spastic indentation.

I reported before the Michigan State Medical Society, Surgical Section 1913 sixteen operated cases in which such a spastic indrawing on the lesser curvature was proved by operation to be associated with well marked duodenal ulcer, no gastric ulcer being found at the level of the indrawing. In many of the cases, especially those in which gastro-enterostomy was done without clamps the inside of the stomach was explored and no ulcer could be found. Among the other conditions in which this sign has been noted by the



Fig. 6. A large collection of gall-stones found in case diagnosed clinically as duodenal ulcer.



Fig. 5. A single laminated gall-stone found in case of suspected duodenal ulcer.

writer and where anatomical proof has been afforded of the absence of ulcer on the lesser curvature at the level of the indrawing have been a number of cases of gall-stones, carcinoma near the pylorus, appendicitis, and Grave's disease. Recently I have observed this sign in two cases of paralysis agitans. In fact it seems that this spastic indrawing is a localized, especially deep tonic constriction of the stomach, the result of vagus irritation, and may be produced by any lesion which causes vagus irritation. The spasm is often overcome by the administration of atropine and it frequently fails to appear with the patient standing. With the patient lying tension on the gastric walls being relaxed the spasm occurs very characteristically. When it is due to ulcer on the lesser curvature there is usually a point of pain on pressure coinciding with the lesser curvature at the level of the spasm and there is no special tenderness on pressure over the duodenal region. When the spasm is due to a duodenal lesion (gall stones or duodenal ulcer) there is no pain on pressure over the lesser curvature at the level of the spastic indrawing but there is usually pain on pressure under the



FIG. 7. Case of hepatomegaly due to adhesions attaching gall bladder to liver. Two gall-stones seen to be present.

right costal margin, and manipulation of the pyloric or duodenal shadow is often seen to increase the depth of the spastic indrawing high up on the greater curvature. On screen examination, peristaltic waves are often seen beginning above this spastic manifestation and pass it without causing it to disappear. The persisting spastic indrawing on the greater curvature has also been observed in cases of carcinoma on the lesser curvature in the antral portion of the stomach, but the carcinomatous deformity may be differentiated by watching the peristaltic waves. When this indrawing is present with the patient standing, it is found to be extremely marked with the patient lying. On the other hand this deformity often occurs with the patient lying supine when it is not seen at all with the patient standing. Sometimes these spasms are transient, being seen one day and not another. If the patient is under the influence of any spasm-relaxing drug, such as atropine, this spastic manifestation may be absent.

Of course, at operation, these spastic manifestations are rarely seen. An hour-glass constriction which almost bisects the stomach in connection with a penetrating ulcer on the



FIG. 8. Hepatomegaly due to adhesions between the duodenum and gall bladder. No gall-stones seen.

lesser curvature may be almost absent when the anesthetized patient's abdomen is opened at operation.

Abnormalities of peristaltic waves. There is a certain variation in depth and frequency of the normal peristaltic waves, according to the tone of the stomach. When the depth of the peristaltic waves is increased and when they appear more frequently than the normal, the inference is that there is some obstruction at the gastric outlet. In pyloric obstruction there is frequently observed a sort of systole and diastole similar to that which is claimed by Cole to occur in the normal stomach. Peristaltic waves may at one moment be practically absent and at other times so strong as to almost cut the stomach in two. It seems that this may represent fatigue and periods of revived activity after recuperation from fatigue. Hyperperistalsis and hypermotility are both suggestive of duodenal ulcer.

Antiperistaltic waves, first described by Jonas, are pathognomonic of an organic lesion



Fig. 9. Case of duodenal obstruction due to adhesions attending an ulcer on the lesser curvature just proximal to the pylorus.



Fig. 10. Deformity on lesser curvature corresponding to ulcer.



Fig. 11. Deformity of the stomach due to ulcer on the lesser curvature 10 cm. from the pylorus. Ulcer shown by arrow.



Fig. 12. Lateral roentgenogram of the stomach showing deformity of the posterior wall due to ulcer with attendant cicatrix.



Fig. 3. Filling defect on the greater curvature due to large tuberculous ulcer.

near the pylorus and frequently point to ulcer. This organic lesion does not necessarily obstruct the pylorus. Antiperistalsis occurs with comparative rarity. I have seen about fifteen cases. Hertz stated as recently a last year that he had never seen it. This phenomenon is best studied when the patient is lying supine. Naturally such study must be made fluoroscopically.

Abnormal emptying time of the stomach. Six hours is the period which experience has suggested as the limit of the emptying of the normal stomach following the Rieder test meal which consists of ten or twelve ounces of farina mush into which two ounces of bismuth oxychloride or subcarbonate have been stirred. The oxychloride is preferable to the subnitrate or subcarbonate. Neither one is necessary since barium sulphate a much cheaper substitute can be very satisfactorily employed. Groedel and others have called attention to the fact that the use of barium sulphate shortens the emptying time of the stomach. The stomach in normal cases usually empties within three or four hours.

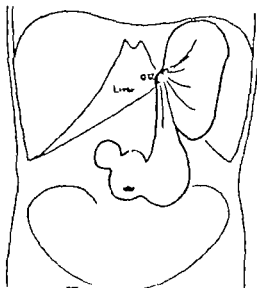


Fig. 4. Duodenum (after Hertz) illustrating the deformity of the gastric shadow due to ulcer on the lesser curvature which has become adherent to the liver.

The residue at the end of six hours may vary greatly from a small trace to practically all the stomach contents. In some cases, bismuth has been found in the stomach 25 or 150 hours following the bismuth meal. In these cases of prolonged stasis, the residue may become scarcely discernible because of the fact that the newly arriving food from each meal dilutes the bismuth contents of the stomach so that the proportion of bismuth is less from meal to meal.

Although Haudek claims that there can be no ulcer without spasm of the pylorus with a residue at the end of six hours, and that he has never seen a case where the emptying time was longer than six hours without serious alteration of the stomach wall, this claim is contrary to the experience of surgeons and many other roentgenologists. Recently Smith has reported a hundred cases of gastric ulcer without delay in the emptying time. Many surgeons, basing their indication for operation upon the statement of Haudek, have been disappointed in finding no evidence of anatomical ulcer of the stomach where a six hour residue has been demonstrated following a bismuth meal.



Fig. 5 Characteristic hour glass deformity does not penetrate ulcer on the lesser curvature such as is illustrated in Fig. 4



Fig. 6 Spastic constriction () on the greater curvature formerly considered pathognomonic of ulcer at the corresponding level on the lesser curvature (b) represents peristaltic wave which began above the spastic constriction and fluoroscopically as seen to progress pylorusward without disturbing the antrum (ax. 1 is now recognized that this spastic manifestation is not pathognomonic of gastric ulcer)



Fig. 7 Spastic indentation (b) on greater curvature opposite ulcer on the lesser curvature. Normal pylorus shown at ()



Fig. 8 Normal stomach and duodenal bulb. Pylorus () bulbous duodenum or first portion of the duodenum () (b) This bulb, well filled out, should be demonstrable in every normal case.



Fig. 9. Characteristic deformity of the duodenal bulb in case of well-marked duodenal ulcer

Early clearance of the stomach, when not due to achylia, may be found in cases of gall-bladder disease (with or without stone) and in pancreatic disease when adhesions to the duodenum are present, and in cases of duodenal ulcer. Cases of early malignant induration of the walls of the pylorus, rendering the pyloric sphincter inelastic, are not rare. In pyloric ulcer with or without actual obstruction, there is delay in the emptying. Gastric ulcer (not pyloric) is not necessarily associated with delayed emptying. It must be admitted however that in many gastric and duodenal ulcers the emptying time of the stomach, after a bismuth meal is perfectly normal.

In duodenal ulcer it is a frequent observation that the stomach begins to empty at once and at a very rapid rate bismuth being seen throughout the small intestine within a very short time. If the meal has not been a large one, the stomach may be entirely empty within an hour. When the meal is larger delayed pylorospasm may be set up and a small residue remaining longer than six hours may result. Duodenal ulcer cases which do not exhibit this quick emptying, at least during the first hour of digestion, are those where actual mechanical obstruction exists,



Fig. 10. Almost complete absence of the duodenal bulb in case of perforating duodenal ulcer with considerable callous formation.

as by cicatricial contraction. The above behavior of the stomach may be explained, perhaps, as indicating that when the meal is a large one the delay is due to the development of a tardy pylorospasm associated with a delayed hypersecretion.

In pyloric ulcer on the other hand, suggestive findings are delayed motility with hypersecretion and early pylorospasm. As above stated ulcer in the body of the stomach is not necessarily associated with an abnormal motility.

Unusual filling of the duodenum. The normal duodenal bulb has already been considered. This first portion of the duodenum normally shows as a symmetrical, smooth shadow which has been called the cap or pillicus ventriculi. The shadow is smooth by reason of the fact that there are no valvulae conniventes in this portion of the duodenum. The bulb is not always well seen immediately after the ingestion of the bismuth meal, but it is usually well seen in the second hour of digestion.

The second and third portions of the duodenum are rarely well seen under normal con-

ditions. But in duodenal obstruction duodenal ulcer achylia and gall-bladder disease the duodenum is frequently seen in its entirety. Unusually marked filling of the entire duodenum is frequently seen in cases of duodenal ulcer and it is due not so much to a lag in the emptying of the duodenum as to unusual promptness in emptying of the stomach.

Pressure pain points. A definite pressure pain point corresponding to the position of the duodenum is often noted during the fluoroscopic examination. The pain point is often seen to definitely coincide with the shadow of the duodenum. It is not, however, pathognomonic of duodenal ulcer. The writer has often seen it in connection with periduodenal adhesions without any evidence (even at operation) of duodenal ulcer. There have been a number of cases, however, in which, in spite of tenderness over the duodenal and gall-bladder shadow, nothing could be found wrong with either of these organs. The writer is satisfied that there is considerable value, however, in palpation over the gastric shadow to localize the points of pain on pressure, but this pressure pain point is not likely to correspond to the location of the ulcer unless there has been periduodenal or perigastric involvement with adhesions.

In the foregoing paragraphs I have only attempted to summarize and correlate the X-ray evidences which contribute to the diagnosis of gastric or duodenal ulcer. I would like to go on record as stating that in the present stage of development we are not justified in believing that the röntgen method of gastric examination constitutes a reliable method of detecting early gastric or duodenal ulcer. Nevertheless, I believe that in general it is true that surgical lesions of the stomach or duodenum cannot exist without some of the foregoing signs being present. I wish to state that I have seen a few well-marked gastric and duodenal ulcers at operation or autopsy where during the X-ray examination there was nothing found either fluoroscopically or röntgenographically which could be considered as suggestive of anything but the normal. It is an astonishing thing how often the bismuth meal will reveal most astounding conditions when they are least expected and on the other hand it may be repeated very often the X-ray findings are quite the ordinary even in cases of gastric or duodenal ulcer when from the clinical study of the case it was expected that the X-ray evidence would be especially characteristic.

DEPARTMENT OF TECHNIQUE

TREATMENT OF FRACTURES BY MEDULLARY BONE SPLINTS

B. CHARLES DAVISON, M.D., CHICAGO

Professor Surgery, University of Illinois, Attending Surgeon, University Hospital and Cook County Hospital.

THE teaching of Mr. Lane has made the open operation for the treatment of simple fractures very popular and successful. The accurate reduction and stable fixation of fractured bones by metal plates fastened by screws is attractive. But the metal plates and screws are foreign bodies and their presence is more or less resented by the tissues.

In a small portion of the cases plated, the material inserted causes symptoms requiring removal as a foreign body. If the foreign body proposition could be eliminated from the open treatment of simple fractures it would be a distinct advantage towards good end-results.

When a simple fracture is held in fair position by external splints, one of the early efforts of nature to remedy the defect is the production of an internal callus, or medullary plug—a plug of new bone-making material, placed in the medulla across the point of fracture.

This plug ossifies and adds in the repair and support of the fracture—it becomes a medullary



Fig. Case. Diagram of left tibia immediately after injury.



Fig. Case. Diagram of tibia in plaster cast after attempted reduction, showing the impaction of the fragments of the tibia. Each pin started reduction.

Read before the Chicago Surgical Society, January 4, 1911.

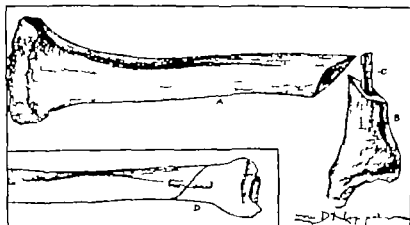


Fig. 3. Diagram of insertion of medullary bone splint.



Fig. 4. Case. Skilogram anteroposterior view after insertion of medullary bone splint in the tibia.



Fig. 5. Case. Skilogram lateral view.

DEPARTMENT OF TECHNIQUE

TREATMENT OF FRACTURES BY MEDULLARY BONE SPLINTS

H. CHARLES DAWSON, M. D., CHICAGO

Professor Surgery, University of Illinois, Attending Surgeon, Cook County Hospital and Cook County Dispensary

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FIG. 1. Case. Swelling of left tibia immediately after injury.



FIG. 2. Case. Swelling of tibia in plaster cast after attempted reduction, showing the appearance of the fragments of the fibula. Lock prevented reduction.

Read before the Chicago Surgical Society, February, 1911.

The needles immediately retracted and held the fragment steady in position (Figs. 4 and 5).

The bone splint was fitted solidly into the medulla of the lower fragment, but loosely into the medulla of the upper fragment.

It is necessary to have the cavity in the upper fragment slightly larger than the bone splint, because it could not enter the medulla in a straight line but must enter in the arc of a circle, the radius of which was equal to the length of the projecting bone peg and the portion of the lower fragment of the tibia which projected above the soft parts, during the manipulation of swinging the lower fragment into position.

CASE. O. S., fracture of left humerus. American, clerk, 37 years of age. Fell from porch while intoxicated, breaking his left arm, admitted to Cook County Hospital at once; mobility and angular deformity in upper third of humerus with one inch shortening. Attempted reduction and immobilization with moulded plaster splint (Fig. 6).

Open operation with insertion of medullary bone splint. Incision over fracture showed spiral fracture of humerus three inches in length, overlying one inch.

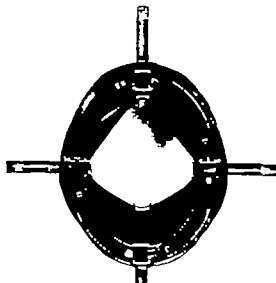
A piece of bone without periosteum five inches long and one-half inch in thickness in each direction, was removed from the tibia and inserted into the medulla of the humerus to the fracture (Fig. 7).

A NEW SELF RETAINING ABDOMINAL RETRACTOR AND WOUND PROTECTOR

B. U. C. BATES, M. D. SEATTLE, WASHINGTON

THIS retractor consists of an oval frame eight inches wide and nine inches long. To this are fitted four retractor blades that work through slots in the frame. These are held in any degree of retraction desired by a ratchet device which may be released by pressing a button on each blade. These blades work through a funnel-shaped piece of rubber so that when the retractor is in place the margins of the incision as well as the field of the abdomen covered by the rubber are completely protected from septic material from within or without. This also obviates the use of towels applied to the margin of the skin incision.

By means of this retractor any degree of retraction in any direction required may be obtained, thereby exposing any quadrant of the operative field desired. It enables the operator to get a larger field through a smaller incision. By reason of its self-retaining properties the abdominal wall can be raised which materially assists in introducing the packing gauze used to cofferdam the intestines from the field. After the packing gauze is in place it is retained there by the tension of the abdominal wall and the upper blade of the retractor. The rubber stretching from one blade to another makes retraction over the whole circumference of the



Retractor partly open.

wound, thus preventing pressure and traumatism by the blades, and the pressure of the rubber prevents any oozing from the wound surface.



Fig. 6. Case. Skiagraph spiral fracture of left humerus slightly comminuted.

bone splint and remains as long as its support is required by the injured bone and then the superfluous part is gradually absorbed and the medullary canal reestablished.

In the cases reported bone material was taken from the opposite tibia and placed in the medullary canal at the point of fracture, doweling the fragments together in substantial manner.

Homogeneous living bone from the same individual is treated kindly by the tissues, and no matter whether it grows in and becomes a part of the bone or whether it acts as a scaffold for new bone-cells, or whether it eventually is absorbed in whole or in part, it will be treated kindly by the tissues and will retain its integrity as a splint long enough for repair of the fracture to take place.

CASE. L. K. fracture of both bones, left leg. Anar Jose, laborer 33 years old. Alcoholic, profligate. Slipped on the ice and fell, breaking his leg, admitted to Cook County Hospital 10000, January 2, 1914 (Fig. 7).



Fig. 7. Case. Skiagraph of the humerus after insertion of medullary bone splint.

Delirium tremens—treatment in fracture has one week. Attempted reduction, plaster cast, position unchanged (Fig. 8). Open operation with insertion of medullary bone splint, January 24, 1914.

Incision over fracture showed spiral fracture of tibia with three-fourths inch shortening. Irreducible by traction on the foot and manipulation with levers. The fracture on account of the impaction and entanglement of the fragments of the back-up fracture of the fibula. A transverse chisel fracture of the fibula was made from the outside which permitted reduction of the tibia.

A piece of bone three inches long and one-half inch in thickness in each direction as removed from the opposite tibia, without its periosteum, to serve as medullary splint for the fractured tibia.

The part of the leg below the fracture of the tibia was turned to right angle to the leg and the bone splint was driven into the medulla of the lower fragment of the tibia with broad hammer sufficiently deep to make the splint firm and solid.

The medulla of the upper fragment was cleared out with sharp bone spoon to receive the upper end of the bone splint (Fig. 9).

The rest of the leg below the fracture, placed at an angle to the axis of the leg with the end of the bone splint protruding from the medulla of the tibia was manipulated so as to enter the end of the bone splint into the medulla of the upper fragment of the tibia and bring into proper position.

stitute the scum of surgical refuse cases in which every sect of medicine and surgery and even quackery have had a chance. Two of this class of cases in our series had lasted forty years, and many had had from ten to fifteen surgical operations.

My purpose is not to show what results I personally can obtain with this method. After all, you are interested in what you yourself can accomplish and, therefore, instead of citing percentages of cures I shall select a few cases for illustration.

Are there other methods in vogue which will compare in their final results with this method? There are.

First. Heliotherapy as carried out in Switzerland by Dr. Rollier.

Second. X-ray treatment systematically applied.

Third. Vaccine treatment.

Fourth. Surgical treatment either conservative or radical.

Let us compare the results which have been obtained with these different methods, taking for comparison from the literature report made by the men who had used these various methods.

HELIO-THERAPY

Dr. A. Rollier makes a complete report of 1,120 cases treated by sunlight in Leysin, a period of ten years from 1903 to 1913. Of the 1,120 cases, 445 cases were of joints and 108 cases of spondylitis which properly belong to joint disease.

Cervical	58
Cervical	70
Foot	94
Shoulder	
Elbow	10
Hand	
Polyarthritides	
Spondylitis	98
Total	645

Of this number 341 were closed tuberculosis without bony changes, 57 closed tuberculosis with bony formation, 40 open tuberculosis with existing bony changes.

Of 443 cases of closed tubercular bacilli joints, 1 were cured, 9 were improved, 3 were not improved and died. Mortality next to 3 per cent.

Of 151 cases in which bony changes formed, 14 were cured, 6 were improved, 5 were not improved, died. Total 15, 1 per cent mortality.

Of 40 cases with in which bony changes were formed, 24 were improved, 8 were not improved, died. Total 40 per cent mortality.

Since Dr. Rollier does not resort to surgical

procedure but relies upon the curative effect of sunlight alone we already have a proof that treatment without surgical intervention may produce very excellent results. His observations, experiments and theories as to the *modus operandi* of sunlight treatment are very instructive but I cannot here go into their details.

THE RONTGEN THERAPY IN JOINT AFFECTIONS

B. Balsh, of Heidelberg clinic, reviews the subject and gives the report of his own results.

The last reports of Dr. Iselin were so favorable that they gave a new impetus for trial in many clinics abroad, but no one could produce such results as Iselin reported. This may not be Iselin's fault, but that of other operators.

Balsh treated 80 cases of joint tuberculosis five of which were operated and 18 still being treated leaving 57 cases in which treatment with X-ray has been completed. Results were as follows: 30 were cured, 17 were improved and 1 died, 10 were not improved and 3 died. Total 57.

Most of these cases were in the late stages with sinuses and thus with the X-ray treatment alone a cure of 30 cases out of 57 has been produced—a most remarkable showing of what X-ray alone can do in these progressed cases.

Balsh states, however, that in some of these cases they had applied the bismuth paste and some of his illustrations show that it had been used. Therefore in these cases the objection could be raised as to whether the X-ray alone was responsible for the cure since we have cases of this kind on record which have been cured by bismuth injections alone without the application of X-ray.

He cites that Sched has recommended that the cases be treated with radiation and on the fifth day after the first application they should be injected with the bismuth paste and in that way the best result could be obtained.

We now come to the consideration of the purely surgical treatment and here I can do no better than cite the report of Professor Garre made before the last Congress of the German Surgeon in Berlin.

The report comprises material from the clinics of Rostock, Königsberg, Breslau and Bonn covering a period of nineteen years work, a collection of one thousand cases which were treated at these different clinics under his own supervision.

He reports 261 cases of tubercular arthritis. Of these they could trace only 168, and 102 of this 68 were still alive, 62 had died—mortality of 47 per cent.

PRESENT STATUS OF JOINT DISEASES AND BEST METHOD OF TREATMENT

B. EMIL G. BECK, M. D. CHICAGO

I WISH to briefly review the latest advances in the etiology, diagnosis, and treatment of the acute forms of joint infections, laying a great deal of stress on vaccine therapy. Also to consider the more chronic forms as follows:

A joint disease is, in practically all cases, a secondary infection except in cases of direct injury. Whatever type of microorganism it is, it is liable to reach the joint through circulation. There are three forms of joint afflictions which we meet most commonly:

First. Those of pyogenic origin.

Second. Tuberculous origin.

Third. Syphilitic origin.

Further, the very chronic polyarthritic diseases, the etiology of which is not yet fully known. By some they are thought to be most chronic type of infection of the joint and the para-articular tissues, and again by others as nutritional changes which tend to the deposition of salts in the joints and ligaments.

The first step in the treatment is a correct diagnosis. I need not mention all the aids we have at our command, but I shall speak of the aid of the stereoscopic radiograph in making a differential diagnosis. I have made an extensive investigation of this method for several years, and have concluded that I am able to make with exactness a differential diagnosis and ascertain the progress of the disease with this method.

I emphasize that the radiograph must be stereoscopic; otherwise the finer differential points are lost. The stereoscope produces a concrete picture of the fine details of the diseased structure which brings out the differential points. A single picture is so out of focus, and gives only the rougher points, which will confuse even the best diagnostician.

Before the era of Pasteur, diseases of the mortality of surgical treatment was most frightful, and the surgeons, discouraged, hesitated to operate. According to Follen's figures, the mortality that time due to operations of hip or spinal curvatures, was 56 per cent to 70 per cent, and now after half century of diligent study and arduous discussions, surgeons have to a certain extent, practically agreed on treatment for surgical joint affection.

When, in spite of all efforts to check the progress of the disease it still progresses, we are

faced with a proposition the solving of which surgeons are not yet agreed upon.

The surgeon who can correctly solve this problem will save many lives and reduce the big army of cripples. It is the treatment of cold abscess which I refer to. The attitude of the physician toward the treatment of this condition is of the most vital importance to the life of the patient. Too many physicians still believe that a fluctuating cold abscess should be opened and drained by a rubber tube. This procedure is more dangerous than most any disregard for surgical sepsis. Calot says: "The physician who opens a cold abscess and drains it with a tube opens the door through which death nearly always enters."

What then would be the proper procedure? Should we wait until it ruptures spontaneously?

No. It should be treated by puncturing with a trocar allowing some of the fluid to escape and then be injected with a modifying substance, such as Calot's mixture formalin or bismuth paste etc. In the past several years I have used bismuth paste (10 parts bismuth subnitrate and 90 parts yellowaseline). All these methods are fully described in textbooks.

If in spite of this procedure secondary infection should take place and a chronic suppurative persist then I recommend the injection of bismuth paste.

It is now about eight years since this method was introduced into surgery and it has, from the beginning, had many adherents, and has been tried not only in hospitals and clinics here and abroad, but has been used very extensively by country practitioners.

Some authors have obtained better results than we have, others have been only partially successful, and in the hands of few the method has been failure.

If we take into account, however that we have to deal with cases which have already been treated surgically and otherwise without success, must regard even the smallest percentage of cures as an actual gain. The analysis of reports from all sources, however, indicates that on an average of more than fifty per cent of these apparently hopeless cases are finally cured by these injections.

You are familiar with such cases. They con-

X-RAY FINDINGS IN THE NORMAL STOMACH¹

B ADOLPH HARTUNG M.D. CHICAGO

RÖNTGENOLOGY has rendered possible examination of the human stomach in the living individual under ordinary conditions and herein lies its greatest value as an aid to diagnosis. But the information thus obtained has forced us to change many of our conceptions of that organ which were based on less accurate clinical methods of examination, and the findings on the operation and post mortem table where conditions were entirely different.

Before considering the stomach itself I shall briefly describe the technique employed in the roentgen examination. To render the stomach visible by the ray a meal is given consisting of about 350 grams of some palatable media such as gruel or fermented milk containing about 50 grams of bismuth oxychloride or 100 grams barium sulphate, either of which are practically inert and tasteless. The little additional specific gravity they induce is negligible for practical purposes as has been proven experimentally. This should be given on an empty stomach and if marked constipation has been present it may be well to precede it by a cathartic, otherwise not, for our aim is always to approximate ordinary conditions as closely as possible. The shadow of this meal in the distended or moderately contracted stomach gives us a fairly accurate representation of the stomach itself.

At the method employed several are in use. The roentgenoscopic consists in placing the patient before the fluorescent screen and directly observing the filling of the stomach its contractions, and its emptying. This may be supplemented by palpation with the gloved hand or specially constructed palparium. With the protective devices now in use, such an examination can be made with practically no danger to the patient or operator. This method although the simplest, is also the most difficult for it necessitates an eye which has been trained to see quickly and accurately moving shadows which to the occasional observer are exceedingly dim and distinct, and meaningless. The roentgenographic method, on the other hand, gives more clearly defined pictures of the stomach at any one instant and if enough negatives are made as in the serial method adopted by Cole, of New York, practically all the phases of contraction can be studied in detail at one's leisure. The patient ought to be examined in different positions to get all the information

available. A combination of the two methods is undoubtedly the best procedure. A third method the cinematographic, as first shown by Kaestle-Rieder Rosenthal combines many of the advantages of the other two but owing to the big expense it involves it is hardly practicable.

To describe the normal of an organ of which it has been said that the only constant thing about it is its changeableness is exceedingly difficult. When empty it is contracted so that its walls lie in contact except near its cardiac end where they are lightly separated by an air bubble—the so-called "Magenblase." The full stomach as seen with the aid of the roentgen ray in no wise resembles the type we ordinarily see pictured in our textbooks on anatomy and which was first described by Luschka in 1873. This is what Forsell calls the passive type of stomach and can be approximated by our distending the organ with gas when the tonus of its musculature is overcome and we have a record only of its fibrous and elastic elements as represented by its submucosa. The anatomic shape of the stomach in the living is determined largely by its musculature and it is this shape we see with the aid of the roentgen ray. As long ago as 1881 Lembert, before the medical congress in London said "The stomach usually critical its fundus touching the diaphragm its lesser curvature to the right, its greater to the left and downward the antrum pylorus turn up and to the right (occasionally backward) as it connects with the duodenum." This practically corresponds to our roentgen ray experience. Fully 80-90 per cent of the normal stomachs conform to this type when examined in the upright position. This is the so-called fish hook type of Riedel or siphon form of Groedel. The other 10-20 per cent belong to the corn-horn type of Holzknecht, the pylorus forming the lowest point the stomach gradually tapering down to this point obliquely from the left above to the right in about the median line. In the horizontal position the shape of the stomach is extremely variable depending on decubitus, pressure and location. Schlesinger has divided stomach into four types depending on the tonus of its musculature: (1) the hypertonic or corn-horn, (2) the orthotonic or fish-hook, (3) hypotonic where the greater and lesser curvature are approximated more than usual and the caudal end somewhat enlarged, and (4) the atonic, an exaggerated form

Of the 168 cases, 71 were cases of closed tuberculosis without abscess. Eight were treated by resection with two deaths, a mortality of 25 per cent. Sixty were treated conservatively with 17 deaths, being a mortality of 28 per cent.

Fifty nine cases had abscesses, of which 23 had resections with 3 deaths, a mortality of 56 per cent.

The remaining 31 cases had fistule, 16 of which were treated by resection, of which 5 died, being a mortality of 31 per cent. Twelve cases were treated conservatively with 3 deaths, making a mortality of 25 per cent.

They have treated 454 cases of knee-joint tuberculosis, 168 of which were resected. They have cured 88 per cent, improved 55 per cent, recurrence per cent, amputation 33 per cent, deaths 25 per cent.

Two hundred and twenty-two ankle cases were treated, 80 of which were resected with excellent results in 24 cases (30 per cent) good results in 25 cases (31 per cent) passable results in 10 cases (12 per cent) not good results in 10 cases (12 per cent) and 6 deaths (6 per cent). On two cases there was no report.

Of cases of tuberculosis of the shoulder they treated 25 8 being treated conservatively and 17 surgically 1 of the latter being resected and 5 excochleated. Of the 8 treated conservatively, 1 left hospital, 4 got better 1 had to be resected later and 1 got better much later.

Of the 12 resected, 8 cases were cured, 3 improved, and 1 not improved and subsequently died.

Of tuberculosis of the elbow 79 cases were treated 7 conservatively cured, 14 improved, 1 not improved 19 excochleated, 3 of which were cured, 7 improved but fistule formed, and 7 not improved 38 were resected, with a result of 25 cured, 0 not improved and 3 died of general tuberculosis 4 had amputations and were cured 1 case an arthrectomy was performed with improvement as a result.

Forty cases of tuberculosis of the wrist were treated. Of the 3 treated conservatively 9 healed and 4 did not of the 14 excochleated 10 were cured, 3 improved, 1 not improved 1 extirpation of tendon both cured 5 were partly resected with 3 improvements and 2 subsequent amputations complete resection with cure and 5 cases were amputated with cure as a result.

The great mortality which surgical treatment produced would of course discourage anyone from bringing it into comparison with the conservative methods, but to be just, in making comparisons, we must consider that the present surgical methods do not produce the same mortality as they did nineteen years ago in high period Professor Garre's cases date. Nevertheless the mortality is so much greater that, even in the hands of the very best men, like Professor Garre results are not to be compared with those of the conservative methods.

I regret that I am unable to give full statistics of my own cases, treated during the past six years. To prepare such report would require several months' tracing of the patients, but it comprises a series of 650 cases of tubercular joints, at least 3/4 being in the latest stages in which abscesses or sinuses have formed.

Thus we dispose of a material of the suppurative type much larger in volume than that of Dr. Rollier or Professor Garre, and useful comparisons can be made only by comparing the same types of cases, namely those in the late stages. The

average percentage of cures in our series was 73 per cent with a mortality of only 3 per cent, the remainder of the cases being either improved or unchanged.

Thus it is evident that the conservative methods of treatment are far preferable to the aggressive surgical procedures, but we regret to say that as long as the poor classes of people cannot avail themselves of such protracted treatment as is carried out at Leyden, the active surgical procedures will have to be resorted to.

As the stomach becomes empty and hence becomes more permeable to the ray rugæ or folds can frequently be seen. The same picture can often be produced by pressure when the stomach is filled.

As regards the emptying time of the normal stomach, much depends on the type under consideration. The hypertonic type can readily empty itself in two hours, the orthotonic in four

the hypotonic in six, and the atonic in eight. Six hours is usually considered the limit of the normal. One precaution is necessary in determining this, that the patient take no food or drink after the original meal, until after the examination for motility has been made.

Close attention to the variations in the normal will often obviate faulty interpretation of the apparently abnormal.

V ARICOCELE OPERATIONS

By WELLER VAN HOOK, A. B., M. D. CHICAGO

THE enlargements of the veins of the spermatic cord are so common among young men that they are met with by every practitioner of medicine. They require no further treatment, in the majority of cases, than the use of a suspensory bandage. But if this is used it must be selected and applied with care.

Operations are indicated only where great discomfort resists treatment by support, or where the testis shows signs of incipient atrophy.

The standard and typical operation is that of the partial excision of the veins of the cord. The shortening of the scrotum by excision of the dependent part is an occasional requirement indicated only in cases where there is extraordinary laxity.

Shortening the scrotum is often done in a haggling, unsurgical manner which is unnecessary if one understands the difficulties and knows how to avoid them.

The skin is not the only structure which supports the contents of the scrotum. They are upheld chiefly by the dartos and the spermatic cord. Furthermore the peculiar structure of the skin must be remembered: it contains a large amount of unstriated muscle tissue. When the scrotum is shortened with scissors great changes in its form and the relations of its walls occur. This is due largely to the contraction of the involuntary muscles and of the connective tissues.

Hence transection of the skin is at once followed by violent and very irregular contraction of the various structures. Much bleeding occurs and, worst of all, some of the vessels, especially the numerous dilated veins, are likely to cease bleeding under pressure and coagulation only to begin bleeding some hours later. The writer has had this most embarrassing experience.

To overcome these difficulties he now operates as follows:

Draw the redundant part of the scrotum through the varicocele clamp with care as to the following details:

1. The clamp must lie in the median antero-posterior plane in order that the lock-on-scar may be continuous with the scrotal raphe. This incision leaves the scrotal walls well supplied with blood vessels.

Apply the extra support in the middle of the clamp.

3. See that the clamp is so firmly and evenly adjusted that all tissues are compressed alike, but not excessively.

The clamp (Fig. 1) he uses was especially designed by him. It is heavier than the common clamp and better made. Its shape gives it special advantages in power and in adjustment. The scrotum is so lax that it can easily be drawn through the clamp to the production of any desired shape of stump. It will be understood at once that the more the tissues are drawn through near the ends of the lock-on the more sharply will the wound curve back toward the body.

Even this powerful clamp springs at mid-point when under heavy pressure. Hence a rein forcement was provided in the screw pressure clamp indicated.

Now having applied the clamp cut away with strong scissors the redundant tissues leaving at least one-eighth of an inch of tissue beyond the jaws of the clamp. Next insert silk worm gut stitches through the suture openings in the clamp, using straight Hagedorn needle. The clamp as designed by the writer has such suture openings as will easily "take" the threaded

needle. The sutures are to be tied immediately upon introduction and they must be drawn firmly to prevent hemorrhage.

When all sutures are tied the clamp is removed and any needed intermediate sutures are applied. The wound must not be dressed until all hemorrhage has been arrested. But no trouble is likely to occur if the clamp is carefully applied and the sutures accurately placed.

The sutures must be left until they can be seen to be no longer acting as supports.

Excision of some of the veins of the cord is usually all that is needed to overcome the difficulties of severe though not extreme cases of varicocele.

This operation, also can be much simplified by the following method

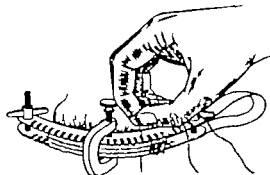


Fig. 1.

Make an incision between three-quarters of an inch and one inch long, passing through the skin and dartos (Fig. 1). This is facilitated by lifting the entire cord, holding it up against the skin in front of the forefinger and thumb of the left hand. Now the various connective tissue layers are incised by quick light touches of a small, very sharp knife until the vein walls roll out free.

The connective tissues need not be individually recognized or studied. Look only for the veins and quickly expose them. Next pull out the veins sharply find the vas deferens by touch—it feels like a small hard whip-cord. Having found it push it toward the scrotum with one vein. The remaining mass of veins is to be excised.

Pull out the veins by drawing towards the testis and then toward the inguinal canal till

no more vein tissue slips out and tension is strong. Tie carefully and strongly each side of the loop with tested catgut leaving long ends of each of the ligature ends. Cut out the loop of veins and tie together the ends of catgut that were left long. This at once removes the redundancy of vein tissue restores the continuity

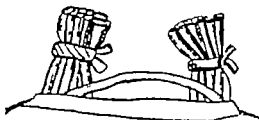


Fig. 2.

of the spermatic cord and raises the testis to its normal position. In the great majority of cases the scrotum retracts to support the testes in a satisfactory manner and the incipient atrophy is arrested. But a testis that has once lost something of size or consistency is not likely wholly to regain the normal state.

The small incision in the skin may be closed, after dropping into the scrotum the dried stump of the cord without paying any attention to the fascial structures, the small wounds in which give rise to no disturbance. Four or five silk



Fig. 3.

worm stitches suffice. Care is to be taken that the wound is well supported for about ten days lest its edges separate under the action of the muscular and connective tissues of the scrotum wall. A suspensory bandage should be worn if pain is experienced. But this soon ceases to be needed.

A CLAMP INTENDED TO FACILITATE THE SUTURE-ANASTOMOSIS OF HOLLOW VISCERA

B WILLARD BARTLETT A. M. M. D. SAINT LOUIS

AT the present time most operators of experience in stomach and intestinal work find it convenient or even necessary in making an anastomosis, to employ an instrument which subserves three purposes viz., (a) holds the viscera fixed in a desired position (b) prevents the escape of contents (c) produces hemostasis.

When the need of some such appliance first became apparent the surgeon chose quite naturally the Doyen elastic pedicle forceps, this being more nearly applicable than anything else found in the ordinary hospital armamentarium.

It does seem surprising however that this simple instrument or modifications of it should have continued so long in this use when its obvious disadvantages are considered. It cannot exert an even pressure along the full extent of its blades, as is readily seen when its structure is taken into account. Near the point a crushing force is exerted, while between the free ends may be had just the desired compression and at the same time the viscus be slipping back at a point midway between these two extremes. At best, the operator has very little idea of just how much force is applied at any given point since it is indirectly exerted in the manner of a lever acting on a fulcrum. Furthermore, the pressure cannot be delicately graduated on account of the distance intervening between the catches.

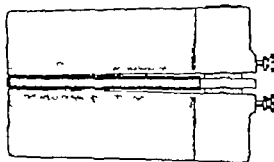
The accompanying drawing gives the details of an instrument which I have employed since June, 1913. Its broad flanges are five inches (twelve and one-half cm.) long by one and three-quarter inches (four and one-half cm.) broad, being ample for any purpose and still never too large as shown by the fact that I have employed them in making an anastomosis on a small dog. The entire apparatus is cast in aluminum, hence is surprisingly light, when its size is considered.

It is used in a gastro-enterostomy as follows. The bowel is compressed by the thumb and fingers of one hand directly forcing the middle blade and one lateral blade together upon it, while

the other hand tightens a set screw this maneuver then is repeated with the stomach on the other side of the instrument.

As is shown in the cut, the lateral flanges are swung closer together at their free ends than at their bases by the set screws. This is necessary to prevent the viscera tending to slip out of their grasp.

A little practice will enable anyone to apply the contrivance easily and speedily although this



Bartlett' Anastomosis Clamp

may not seem so the first time it is used by one accustomed to the elastic clamp only.

The following advantages may be fairly claimed for the contrivance.

1. It compresses the viscera evenly throughout its entire length.

2. The amount of compression is known being directly applied and controlled by the surgeon's fingers.

3. The most delicate adjustment of the instrument is possible.

4. When locked in position it constitutes a thin metal plate about five inches (twelve and one-half cm.) by four inches (ten cm.) which effectually prevents protruding viscera and gauze packs from getting into the field of operation. It goes without saying that the probability of soiling is thereby lessened.

AMNIOTIC MEMBRANE FOR THE PREVENTION OF POST-OPERATIVE PERITONEAL ADHESIONS

A PRELIMINARY NOTE

BY C. B. LYMAN, M. D., DENVER

Professor of Surgery, University of Colorado

AND

W. H. BERGTOLD, M. D., DENVER

Attending Physician, Saint Joseph Hospital

MANY abdominal operations result in adhesions, not because of faulty technique but through the necessity of breaking up adhesions in existence prior to operation. Such separated adhesions usually recur promptly after operations, and it seems to us that this constitutes one of the weak points in abdominal surgery because no method has been devised which will positively prevent such recurrence. It is also very desirable that some method be invented to prevent, primarily, the formation of peritoneal adhesions where the operative procedure unavoidably causes large areas of peritoneum to be denuded of endothelium. Obviously what is needed is some method which will prevent organization of the plastic material that temporarily covers the raw peritoneum and will keep such denuded surfaces apart long enough to permit complete endothelial resurfacing. It is probably true that such a device is needed only during the first forty-eight hours after operation, a period which is sufficient to allow complete repair of the denuded peritoneal surfaces.

It seems to us that up to the present, all methods aiming to prevent peritoneal adhesions have been largely or wholly unsuccessful, except of course where the conditions permit of covering denuded areas by plastic operations, methods applicable at best to a very limited number of cases. The ideal procedure would seem to be the interposition between the denuded area of some kind of thin animal membrane. It would have to be sterile, non-irritating and capable of being absorbed, yet resistant to absorption for at least forty-eight hours after operation. Various tissues have been utilized for this purpose, mainly Cargile's membrane, this, however, is not to be obtained in very large pieces, which renders it more or less useless when one has to deal with extensive areas of denudation.

Many animal membranes have been considered by us, but all have been rejected, either as too difficult of absorption, too difficult to secure sterile, or too unyielding to be safe.

It finally occurred to one of us (Bergtold) that amniotic membrane might be suitable in every way for the purposes in mind. The following case history of a patient under the care of one of us (Lyman) describes the method of preparation and preservation of this membrane, the technique of its use, and the apparent result.

The patient, a man of 3 years, had been operated upon for appendicitis some seven years previous to coming under observation here; she was operated by one of us (Lyman) for gastric ulcer two years ago, a posterior gastroenterostomy and freeing of many adhesions being done. Following this operation she had symptoms which could be explained only by the existence of bandlike recurring peritoneal adhesions in the upper part of the abdominal cavity and in November last an operation was done for the purpose of correcting this condition. Very extensive adhesions were again found, adhesions which involved the liver, gall-bladder, duodenum, stomach and transverse colon. These were all freed, the raw surfaces smeared with sterile oil, and the abdomen closed. Within week there was return of all the symptoms which had existed prior to this last operation, and continued for six weeks, at the end of which time it was decided to again open the abdomen, and employ chorionic membrane to prevent new adhesion formation. This was done on December 20, 1913, when three sheets of chorionic membrane were used each about six inches square. One was interposed between the liver and gall bladder and the duodenum and stomach, the second was placed between the transverse colon and small intestines beneath the colon, and the third was placed under the abdominal incision, all three sheets being held in place by catgut stitches.

It is now more than five months since this last operation, and the patient has remained entirely free from the distressing symptoms which had previously been in existence for many months.

This membrane seems especially suitable for work of this nature in view of the fact that it can be obtained in sheets of large size, that it is sterile to start with, that it is easily preserved and kept sterile, and that it is thin and probably easily absorbed.

The material (amniotic membrane having been selected by Lyman) used by us was obtained from a patient free from constitutional disease. It was prepared by washing in running water for two hours and then kept in one per cent hypod solution until needed. The indication to it, so far as

e have had experience, is that it is slippery and friable when prepared by the method detailed above. We believe this objection can be overcome by placing the membrane in absolute alcohol for a few days, preserving it in 50 per cent alcohol, and washing it thoroughly in sterile normal salt solution before using it.

We hope to publish the results of animal experiments designed to test the method.

This preliminary note is published in order that the method may receive early attention, and be subjected to test at the hands of our colleagues. It would seem to us, in so far as one can ever draw

conclusions from one experience, that we are justified in feeling—

A. That this method is harmless.

B. That it does prevent the formation of peritoneal adhesions.

C. That it is easy of application.

D. That it is worthy of further trial.

NOTE.—Since the above was written, Lyman has employed this method in six other cases, in all of which the results have been eminently satisfactory the preoperative symptoms due to adhesions not having recurred up to date. Since the first operation we have been preserving the membrane in one-half per cent solution of formaldehyde in seventy per cent alcohol.

THE ELECTRIC DRILL SAW REAMER, AND TREPHINE IN BONE SURGERY

By CHARLES GEIGER, M D SAINT JOSEPH, MISSOURI

FOR some time those who are engaged in the practice of surgery have realized the necessity of modernizing the instruments and methods employed in operating upon the head and large bones. The old crude method of employing the chisel hammer and hand drill are unscientific procedures, requiring too much valuable time, and exhausting the patient.

In modern bone work it is absolutely necessary in some cases, to remove bone-grafts varying from two to ten inches in length. The only correct method to do this is with the electric circular saw. In the latest treatment for Pott's disease a bone graft is taken from the tibia of the individual suffering with this disease the length of the graft depending upon the number of vertebrae that are diseased. The graft extends into at least one healthy spine of the vertebra above and below the diseased member or members. In fractures that cannot be held in apposition by methods commonly used, and also in ununited fractures, in place of Lane plate bone-grafts are used. The grafts are usually taken from the tibia. After the ends of the fractured bones have been reamed out with the electric reamer the graft is inserted into the ends of the fractured bones. All bone-grafts must fit snugly otherwise they are liable not to grow. The operator should always keep in mind the importance of preserving the periosteum on the graft, as the periosteum has much to do with the blood supply and with the life of the graft.

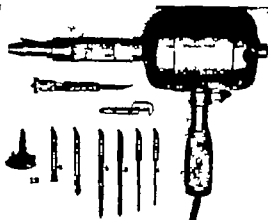
Eminent surgeons have found that handling,

manipulating and trauma are the causes of infection in bone grafting operating on ununited fractures or any plastic bone work and the slightest infection is destructive and hazardous to good results. The above causes of infection are eliminated by the use of this set of instruments.

The object of this instrument or device is to supplant the cable which usually conveys the power from the motor to the instrument the cable has been used by all other motor bone sets. It is always in the way and if bent at right angle, or at any acute angle while it is running it will generate heat, and its action be retarded. The Geiger device, motor and all, is held in the hands of the operator and gives firmness and rigidity to the instrument on account of the weight and firmness with which it can be held. The operator by a motion of his thumb turns on or off the electricity without any effort, as it is always at his thumb's end.

Owing to the weight and firmness with which the instrument can be held, and the motor being under perfect control, the operator is absolute master of the situation, while using any one of the instruments, in the most delicate bone operation.

This instrument which I have devised comprises a one fifteenth horse power universal 110 volt motor. The housing is aluminum. The motor is wound with an enameled wire. The enameled is baked on with a temperature of 1000 degrees F and all connections are insulated



with a special insulation (Bakallized fiber). The switch is made of dilecto. There is nothing about the motor that can burn or be melted with a temperature lower than 130 degrees C. which gives us an assurance that the motor can be thoroughly sterilized, with dry heat, without harm.

The speed of the motor is 7000 R. P. M., reduced with a double set of gears to 400 R. P. M. The back gearing of the motor increases the torque at the instrument seventeen times, thereby giving all the power that is required. It has a handle and a hand piece which are cast integral with the housing of the motor. The hand piece gives firmness to the chuck. By reason of the construction, the operator has perfect control of the instrument.

The handle and hand piece are at right angles with each other. The hand piece is four inches long. At the outer end of the hand piece is a ball bearing which receives the outside thrust, or the inward thrust, of the instrument, so that any pressure brought to bear upon the instrument will not interfere with the power of the motor.

The chuck, which is a special one, is simple and effective, giving absolute rigidity and firmness to the instrument while in operation. The instruments are interchangeable in the universal chuck, and the instrument to be used by the operator can be quickly adjusted or released, as will be seen by a glance at the construction of

the chuck. The motor complete, weighs about four pounds.

Any surgeon who has had much experience with bone work appreciates the great difficulty of enlarging holes in bone with the ordinary hand reamer or chisel. In making holes for wiring bone the electric drill is unsurpassed as it penetrates without pressure.

The trephine found in this set is a new creation, and has no equal in efficiency. The guard and center pin are regulated by a thumb screw. The guard prevents the instrument from plunging into the cranial cavity. It can be set at any depth desired by a simple movement of the finger.

In mastoid work it does away with the jarring and concussion caused by hammering, and prevents the possibility of puncturing or lacerating the coverings of the brain, not only in mastoid, but in other cranial work.

The electric saw will be found of great service in removing plaster casts, only one-tenth the time being required, as compared to the old method, and the operator is relieved of all work.

The cranial saw is simplicity itself and is very effective in its work. It has a guard that dissects the dura from the skull, and at the same time protects the soft parts from being harmed by the saw. There is one special burr in the set (No. 5) which has a sharp point, and the cutters are cross-cut. This burr cuts with much more ease and much faster than the ordinary burrs.

The complete set consists of one motor, one sterilizer, two drills, two burrs, two saws, with mandrels, one trephine and one cranial saw. The two saws that go with the set are both one and one-fourth inches in diameter, one having twice the set of the other.

This instrument was tried out by Dr. John B. Murphy of Chicago, during the Clinical Congress of the Surgeons of North America, November 13, 1913, and he stated as follows: "This is a first-class device, and by the use of this set of instruments—trephine, cranial saw burr and drills—we simplify and modernize bone surgery, also reducing the time and labor, both of which are essential factors in this important branch of work. The great power and efficiency of this small instrument, as motor saw, electric drill, reamer and trephine, deserve the highest commendation of the profession."

ANÆSTHESIA IN SURGICAL RESEARCH

A SIMPLE, ECONOMICAL AND EFFICIENT APPARATUS FOR ORDINARY ROUTINE WORK

BY BERNARD FRANCIS McGRATH, M. D. M. V. CLINIC, ROCHESTER, MINN.

THE method herewith depicted and described contains nothing which is new in principle.

It is presented for what it is worth, as a well tested, efficient and comparatively inexpensive routine procedure. Anæsthesia is induced by means of a cabinet and continued with the apparatus shown in the figures. A rubber tracheal tube is attached to the horizontal limb of a three-way metal tube (Fig. 1). The latter contains within its lower limb an inlet valve and an outlet valve within its upper limb. The former valve opens with inspiration to admit ether and closes with expiration; the latter closes with inspiration to exclude air and opens with expiration. The lower limb is enclosed in rubber tubing and inserted into the neck of an

of ether. A small opening is made in the top of the latter allowing a current through the ether vapor. In a side of the upright of the three-way tube is an opening for the admission of extra air. The amount of air is regulated by a perforated cuff. The three-way tube with its usual attachments may be sterilized. Some of the various combinations which may be effectively employed with the apparatus are shown in Figs. 2, 3 and 4.

Application. Under deep anæsthesia the jaws are separated, held apart with loops of strong tape and the tongue is drawn forward with forceps. The laryngeal opening is made visible and easily accessible by means of gentle traction on a forceps lightly applied to the frenum of the

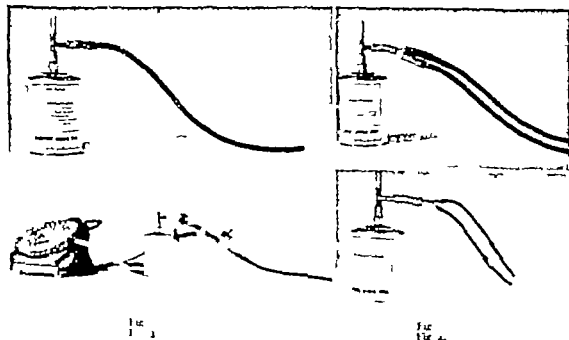


Fig. 1
Fig. 2

Fig. 3
Fig. 4

Fig. 1. Location of inlet and outlet valves of three-way tube. (1) Opening and seal for regulating extra air. (2) Tracheal tube. Fig. 2. Removal of the tracheal tube and applying the arrangement shown in this figure. The animals are anesthetized with ether vapor. This has been successfully employed in each case of tracheotomy.

Fig. 3. Lower limb of three-way tube. (1) Inlet valve. (2) Opening for admission of extra air. (3) Perforated cuff. (4) Outlet valve. Fig. 4. Upper limb of three-way tube. The mouth is held open as far as possible and about one inch packed about the larynx with gauze. Commonly used before the tracheal method is adopted. The latter is preferable.

epiglottis. The tip of the tracheal tube is inserted into the opening of the larynx the left index finger placed behind as a guide and the tube now passed into the trachea.

The mouth is held closed with a piece of tape and, if necessary a small amount of absorbent cotton is placed in the anterior nares. There

is usually sufficient space between two teeth for the tracheal tube. This apparatus has been used by the writer in more than two hundred cases. It is practically automatic, requiring but little attention and, consequently may be useful in the absence of adequate assistance or where equipment is limited.

PITUITRIN IN INTESTINAL PARESIS FOLLOWING ABDOMINAL OPERATIONS

R O IL STANLEY, A. B., M. D. CONCORD, NEW HAMPSHIRE
Assistant at Margaret Purdy General Hospital

PITUITRIN has been extensively used recommended and its results reported in obstetric practice. I have searched for literature giving definite results of its use in cases of intestinal paresis following abdominal operation in which there has been extensive manipulation of the viscera. The manufacturers include this condition in their list of indication for the use of pituitrin but furnish no definite statistics.

It has been frequently observed in obstetric practice that soon after its administration there is often micturition and sometimes defecation but there is difficulty in stating whether these functions are caused by the action of the pituitrin or the pressure of the overlying head.

However I have noticed bowel movements following the injection of pituitrin, after the placenta was delivered. My purpose in reporting these three cases is merely an attempt to stimulate report from other physicians who have had greater opportunity to observe effect of the drug.

CASE. Female age 29. Operation, double salpingectomy. Many adhesions were found in the pelvis including considerable area of intestine. Thirty-six hours after the operation the involved intestinal obstruction. Again the abdomen was opened and the adhesions causing the obstruction were broken. Both operations required much manipulation of the gut. A few hours following the second

operation the patient's belly became greatly distended and all efforts of obtaining expulsion of gas failed. The rectal tube was passed, enemas, high saline enemas and enemas of castor oil, milk, and turpentine were given without result. Physostigmine, hypodermatically failed to help. Hot turpentine stupes were applied to the abdomen. At this stage one cc. of pituitrin was given hypodermatically and repeated every hour. Before the second injection the patient expelled small amount of gas. After the second injection she had large fecal movement and expelled large amount of gas. Treatment was continued for 24 hours. Patient made an uneventful recovery.

CASE. Male age 34. Operated upon for appendicitis. The appendix was found in mass of old adhesions and required much manipulation to free it. Ten hours following the operation the abdomen became greatly distended.

Gas which did not respond to enemas. One cc. of pituitrin was given and fifteen minutes later the patient expelled large amount of gas. After the second injection there was fecal movement. Only three injections were necessary.

CASE. Woman, age 45. Operated on for uterine hernia following abdominal section for an ovarian cyst. There were many adhesions of the intestine to the parietal peritoneum. Fourteen hours after operation the bowel became greatly distended and injections of pituitrin were begun. After the third injection the patient began to expel gas and had no further difficulty.

It is evident that one must be sure that the intestine is not obstructed by firm adhesions or other abnormal growths. For this reason, it is advisable to begin the administration of pituitrin soon after the operation before adhesions have had time to become firm.

TRANSACTIONS OF SOCIETIES

CHICAGO SURGICAL SOCIETY

A REGULAR MEETING WAS HELD DECEMBER 5 1913 WITH THE PRESIDENT DR. M. L. HARRIS
IN THE CHAIR

DR. ADOLPH HARTUNG read a paper by invitation entitled "X ray Findings in the Normal Stomach." (See p. 76a.)

DR. HOLLIS E. POTTER read a paper by invitation entitled "Mechanical Factors in the X ray Diagnosis of Pathologic Conditions of the Stomach."

DR. JAMES T. CASE read a paper by invitation entitled "The Röntgen Findings in Gastric and Duodenal Ulcer." (See p. 739.)

An invitation was extended to any visiting physician to take part in the discussion.

DISCUSSION

DR. CHARLES SPENCER WILLIAMSON. I have been very much interested in the remarks that have been made by the various speakers and from the standpoint of an internist I can hardly expect to add anything of interest to what has been said. We internists have had some experience with the X-ray and with X-ray experts, and there are one or two things which it may not be out of place to discuss here. First I was interested in the emphasis that Dr. Hartung placed on the whole subject of rugae produced by pressure. It would seem simple to comprehend that when the stomach is filled with bismuth it would be in such a position and relation to the backbone as to cause apparent stenosis or that other peculiar phenomena should exist. This has led in two or three different cases to erroneous diagnoses, the X-ray operator having taken as he supposed simple pains to do away with these pressure signs, and yet for all that in some way the backbone pressed against the stomach and produced signs which were attributed to carcinoma, etc. and in two cases it actually led to a diagnosis of carcinoma, and operation for that condition was undertaken.

With reference to poses, I am very much interested in the subject of enteroptosis and I want to call attention to one thing that has led some times to the clinician being held in disrepute by his X-ray colleagues where as a matter of fact,

he did not deserve to be. These are cases in which the old-time methods of determining the position of the stomach were resorted to. The method I take it, most frequently used, is inflation by a double bulb with air. When you try to determine the location of a patient's stomach by the method of inflation you do not get a correct silhouette. Let us stop to think of the conditions when we pump up a patient's stomach with air. Naturally it is fairly taut, and then, with the patient in the erect or recumbent position, we percuss it out. The stomach takes on a cylindrical form and what we percuss out is, not the silhouette but that part in contact with the abdominal wall. Now the portion below which is and cannot be percussed out appears when the stomach is filled with bismuth, two inches lower than when we percussed it out. On two or three occasions the internist has been held in disrepute in determining the position of the stomach when, as a matter of fact, a difference in the method of percussion is what led to the apparent discrepancy. From my standpoint as an internist, I find the Röntgen ray a great help in the diagnosis of gastro-intestinal, especially in lesions of the oesophagus, which have been dwelt on fully and it is in these conditions that I think the X-ray does something which can be done in no other way as well.

Again, in adhesions between the duodenum and gall-bladder and in adhesions about the pylorus it is very valuable. These are, as the internist knows, hard to differentiate because the symptoms are so vague and so general and they point towards several different organs rather than to the offending one. I can heartily agree with all that has been said as to the value of the X-ray and of the great necessity of having an expert to interpret the pictures.

So far as the diagnosis of ulcer of the stomach and carcinoma is concerned, I have had the opportunity to see two flecks from a large number of pictures I have had taken in which the trouble was thought to be due to gastric ulcer. One

case the wife of a colleague from an adjoining state and the other a patient in the city showed these flecks beautifully. But that is a negligible quantity. These do not often lead toward a satisfactory diagnosis.

I had at the present time a case under my care in which, with a palpable tumor I made a diagnosis of cancer of the stomach. My colleague, a very prominent surgeon, and I could not agree. A fluoroscopic examination was made by one of the most expert operators and nothing could be determined definitely, and yet carcinoma was taken up in the face. The patient died peacefully. Castrated at very short carcinoma was present. The case shows that even usually the findings interpreted by an expert X-ray operator may be perfectly correct. How I explain this I do not know and I must leave the explanation for those who know more about X-ray findings than myself.

I am one who adheres to the idea of Leube that there is only one way to determine the motility of the stomach satisfactorily. That is the method made by Leube and called after him. I agree, but it is a little awkward to the patient. It is put in an abnormal condition when he takes a blinthe meal. I do not believe in blinthe or any other similar thing. It is a normal substance which to feed a patient. The general attitude is to put it toward the end of the first repurchase. The way to determine the motility of the stomach is to give a normal meal and not a blinthe meal. I very clearly saw in the fact that the patient now and then. When a patient is given test meal of test meal, he knows at each pump it to be used in connection with it. It is a result of the imaging error he experiences temporary status. It is the same with the blinthe meal. I have seen quite a few cases where there was not the slightest suspicion of actual fast, yet there was a condition of fast due to nervousness. That is one of the inevitable errors of the method, and in my practice I have found the point where I rarely give the regulation motor test meal. I have a patient eat an ordinary dinner and see whether the stomach empties the normal time. That gives more correct reading of the motility of the stomach than can be gotten by the radiogram.

When confronted with the same proportion in regard to blood-pressure. We are all familiar with the fact that when a man comes into the office his pulse rate may be 100 and blood-pressure about 160, but when the excitement has worn off his condition is different. This obtains to a lesser degree in the stomach than it does

elsewhere yet for all that it is not to be considered a negligible factor. While we can learn much regarding the motility of the stomach after a blinthe meal, we are putting the patient in an entirely abnormal condition. We are doing what one author tried to do a number of years ago when he introduced the intragastric bag. When you have a patient who is pretty well trained it goes, but the first time you do it on any patient you find it is unsatisfactory.

I wish to conclude by expressing my great gratitude to roentgenologists for the great aid they give us in certain cases and all we must not build upon the X-ray as an infallible diagnostic aid in cancer of the stomach. Many internists are at fault in expecting more from the method than can really be legitimately expected from it.

DR ARTHUR DEAN BRYAN. I think we are all to be congratulated on having the opportunity of listening to the three papers that have been presented this evening. I want to take this opportunity to congratulate the men who gave us this paper. Personally I believe that the X-ray has been of a good deal of service in the stomach and that in the future it will be of very much greater service than it has been so far. Because I regard it as being distinctly in the developmental stage. I think it gives us a splendid opportunity if we all combine forces, if we all give a good part of clinical research work. This work need not be done not by men like Dr Ellis, the internist or by Dr Case or by Dr Fletcher or by Dr Hartung, a radiologist or by Dr Harris, or other surgeon, but this work should be a combined by team work. It does not look like a X-ray man to stay in his laboratory and do the best X-ray work and go no farther with it. It does not do it all for the internist to see his patients and make the most careful examination possible and go no farther with it. It does not do it all for the surgeon to simply take these cases as they come to him without the aid of these three men and attempt to work out the problem himself. My conception of this problem I shall present to you. We have been doing a great deal of interesting work in the last few years along this line. I suppose my colleagues and I are doing possibly a hundred stomach cases a year and these are done almost entirely in conjunction with the internal medical men, and of late since this work has developed, in connection with the radiologist. So I think this would be a mighty good suggestion for team work along this line. I think the internist should take care of these problems and exhaust

all clinical means at his disposal, and then after he has obtained all the evidence that he is accustomed to handle in his way let him draw on a blank form the abdomen with the stomach, the pancreas, liver and gall-bladder in position and let him outline his conception of the pathological anatomy or what he believes to be the actual pathologic anatomy in that case from his clinical findings, then let the radiologist do the same thing. Let him study the case very exhaustively and draw a picture of what he believes to be the pathologic findings in that particular case. We are actually doing this very largely in our own work. If a case comes to operation, or as a few of them do, to post mortem examination the exact pathologic findings can be determined by the surgeon or pathologist. In that way we shall be in a position to unravel many of the problems that are so far pretty knotty ones and difficult ones, and I would suggest that when the surgeon operates on these cases the radiologist be present at the operation so that he can actually see for himself and have a mental conception of the pathologic anatomy in that particular case and check it up with the X-ray findings. Certainly the internist should be at the operation as he usually is, and see the same findings. There is one thing I should like to suggest to these roentgenologic in connection with the evidence that they must submit to the internist and to the surgeon, and it is this. I am sure their screen work is excellent, of definite value and indispensable but the radiologists must bring to the internist and surgeon some evidence definite, concrete that the surgeon and internist can study not in dark room but in the light in their words study the case with the X-ray with the screen work as thoroughly and definitely as you can but you will have to submit to the internist and surgeon a series of plates of what you believe to be the local evidence in that particular case. I feel confident that a good deal of bad work has been done with the X-ray not only in this particular field but in other fields. At the present time I have many patients sent to me with a bluish picture and with request to stitch up the transverse colon to take care of in the stomach, or make an anastomosis between the ileum and sigmoid simply on the X-ray evidence. That is not the sort of work that Dr. Case, Dr. Potter and Dr. Hartung are doing but it is the kind of ignorant half-baked work that is done by men with little experience in X-ray work and these cases are operated on by men with little experience in surgical work. It belongs to such a society as this and with just such a union of

forces as we can bring together to place this work on a sound useful basis and develop out of it the great possibilities that it is certainly capable of giving.

I want to relate briefly the history and show the autopsy specimen of a case of jejunal ulcer following a gastro-enterostomy with adhesions and perforation into the transverse colon. Dr. Case will show the X-ray findings which were obtained before perforation into the colon had occurred.

Patient, male, age 55, entered the service of Dr. Bevan at the Presbyterian Hospital, 9, with ulcer symptoms of ten years' standing. He had been treated medically three times with only temporary relief. He was operated on and a duodenal ulcer as found. Posterior gastro-enterostomy was performed. Patient as entirely relieved for period of nine months when symptoms of the ulcer returned and have continued ever since. He was treated medically for three months in the summer of 1910 and kept himself fairly comfortable most of the time by careful dieting and the use of allulies bet. one meal.

The X-ray examination by Dr. Case, as made in 9, 10, 11 months ago the patient was taken suddenly with pain in the abdomen, some nausea and vomiting and was confined to his bed for ten days. Since then his ulcer symptoms have been worse. There has been great deal of belching and flatulence. The breath has been foul. There has been frequent nausea and vomiting. History of undigested food in the stools nor of having vomited feces. Stomach analysis showed continuous secretion with acidity ranging around 70 and no ferrous. Stool analysis showed occult blood occasionally but no undigested food. X-ray examination as made.

A diagnosis of recurrent ulcer location uncertain, was made and second operation was performed. On opening the abdomen the transverse colon as found adherent to the seat of the gastro-enterostomy and the anastomosis adherent. Finger been introduced from the stomach into the jejunum. No ulcer could be found anywhere. The duodenum was closed by crushing ligature with catgut and surrounding the seat of ligature with strip of fascia from the sheath of the rectus. A half-hour before the operation the patient passed stomach tube and asked out his stomach things which he as accustomed to doing. After recovering from the anesthetic he developed pain in the upper part of the abdomen, chest and back. The pulse became rapid and weak and frequent vomiting set in and he died at the end of twenty hours. At autopsy the cause of death was found to be perforation of the apparently healthy esophagus, 1 cm. above the cardia, with hemorrhage but no infection of the mediastinum. No scars nor ulcers are found in the stomach. There was scar from healed ulcer on the superior wall of the duodenum just beyond the pylorus. Transverse colon as adherent to the jejunum, the seat of the gastro-enterostomy. Upon opening the jejunum punched-out ulcer the size of a cent in front piece. A moderately indurated area was found on the anterior wall of the jejunum beginning 1 cm. below the gastro-enterostomy ring. The colon was adherent over the ulcer and extending off from one margin there was perforation but it almost as large as the gastro-enterostomy opening. The finger could readily be carried from the stomach into the jejunum and out into the colon.

Ulcer of the jejunum following gastro-enterostomy is now recognized to occur in about 1 per

cent of the cases, and of the more than 150 reported cases that have been confirmed at autopsy or operation about twenty five have perforated into the transverse colon. This is the third case which I have seen at autopsy, and in all three there was a perforation into the colon. In one case eleven years after operation the jejunal ulcer had healed leaving only the jejuno-colic fistula. All of the colic fistula have formed in cases where

the posterior anastomosis had been made either by the Y or the ordinary method. Several of these cases have been diagnosed and the X-ray findings have been of great service. Bismuth by mouth may be seen in a short time passing over into the left half of the transverse colon, while bismuth per rectum soon passes into the stomach. The immediate cause of death was as unusual as the complicated ulcer findings.

CHICAGO SURGICAL SOCIETY

A REGULAR MEETING WAS HELD FEBRUARY 6, 1914 WITH THE PRESIDENT DR. M. L. HARRIS, IN THE CHAIR

DR. EMIL G. BECK read a paper entitled *Present Status of Joint Diseases and Their Best Treatment.* (See p. 757)

DR. FREDERICK G. DYAS read a paper entitled, *"Streptococcal Infections with Special Reference to Arthritis and Its Treatment"* (See p. 734.)

These two papers were discussed together

DISCUSSION

DR. A. J. OCHNER. Dr. Beck's enormous experience is certainly very valuable and clear since his demonstration of the first case we have followed the methods that he has described from time to time. I found it was not very easy to follow the exact directions, however and in a few cases in which we used a 25 per cent mixture of bismuth and asafetida there was some degree of bismuth poisoning. We also had one fatal case.

I think it is very important in these cases of cold abscesses to use weak solutions.

There is one point that Dr. Beck has spoken of frequently which almost no one seems to remember. Surgeons frequently do not get very good results where there are several sinuses on account of a faulty method of injecting them. Some of these patients have several sinuses as seen in one of the patients exhibited this evening. Dr. Beck tells us to inject the bismuth paste slowly into one sinus until it begins to escape from one of the others. Then he places his finger upon the other sinus and keeps on injecting slowly until it escapes from the third one, then closes that and lets it come out of the fourth, etc. Since we have followed this plan our cases have recovered as smoothly as those of Dr. Beck but before that they did not.

In the rather acute tubercular infections in knee-joints, especially in children, I have in good many cases disinfected the skin thoroughly and made an incision on the external and one on the internal aspect, then applied a large boric acid and alcohol dressing, made extension put the leg in a plaster cast, and in quite a considerable number of these cases I have had perfect motion afterwards. I would not advise anybody to use this method until I have had about one hundred cases more but so far I have not had any bad results with them. They have done wonderfully well, and I have had beautiful results. I simply mention this without urging anyone to follow the method, but until we have a bad result in one of these cases I shall continue to use it.

The paper of Dr. Dyas is very interesting and instructive.

DR. BECK (closing). I am glad the subject of bismuth poisoning was brought up by Dr. Ochner. Although I have it in my paper I did not speak of it. In over two hundred cases treated with bismuth paste in the practice of my brothers and myself we have not had a fatal case because we have been exceedingly careful. I have a case now in which the patient barely escaped having bismuth poisoning. It is a case of empyema. As soon as I discovered the signs of intoxication I washed out the paste with olive oil, and all symptoms disappeared.

While in St. Louis about two months ago I was informed by a prominent surgeon there that he had a case of bismuth poisoning. I went with him to the hospital and saw a case of severe intoxication. This was a case in which there had been a psoas abscess, into which the doctor had injected about eight ounces of the paste and

left the blamuth in. He showed me a picture and I asked him what percentage of blamuth he had used, and he replied, Just what you prescribed. From the density of the shadow I could judge that instead of a 10 per cent mixture, a much stronger mixture had been used, and furthermore, the paste had been left in the cavity. This was a mistake. We immediately opened the abscess and washed the paste out with oil. Subsequently I received a note from this surgeon in which he expressed his gratification at the disappearance of all symptoms of blamuth poisoning. I believe that patient would have died if we had not promptly done the right thing, as only mouth washes were being given by the internes.

I have here a young man who for twenty years has had hip-disease with eight sinuses. He has a rectal fistula resulting from the hip-joint disease. I here show a stereoscopic radiograph of his case which is rare and most instructive. He has no bchium on one side. It was all destroyed by the disease. You note that the paste passes from the hip-joint through the abdomen to the rectum. The other openings are all around the hip-joint. He has improved considerably since receiving the injections.

There is one point I wish to allude to which may interest you. I want to explain why all these patients gain so much in weight. Here is a patient who weighs ten pounds more than he has ever weighed in his life. Many of these cases gain in weight out of proportion to their previous normal weight. How can we explain a gain of two or three pounds a day for one or two weeks. I have had some of these patients gain fifty and sixty pounds. I have a theory that I have advanced, and it is this (illustrating on the black board by diagrams). When a chronic disease like tuberculosis develops it simultaneously produces a corresponding degree of immunity. The longer the disease lasts and the more organs are affected, the greater will be the degree of immunity. In other words, the immunity tries to keep pace with the progress of the disease. If a man has tuberculosis of the testis, kidney and bladder each disease-producing area will produce its proportion of immunizing substances. Let us present this in figures. Let us suppose a man has ten units of the disease in the kidney, five in the bladder and ten in the lung, a total of twenty-five. He has already developed an immunity of eight from the kidney, three from the bladder and seven from the lung. He is shy two, two and three, correspondingly. He needs an immunity of twenty-five. As soon as the units of immunity overreach the units of

representing the disease-producing areas or toxins from them spontaneous cure takes place, such as you find in thousands of cases of tuberculosis of the lung. This margin of needed immunity can be produced artificially by fresh air, vaccines, sunlight, and by different treatments. But what we are doing is something different. We reduce the disease-producing area. If we remove the man's kidney, he has left a disease-producing area of only about fifteen, and the existing immunity of eighteen is sufficient to take care of all the remaining disease in other parts of the body. If you remove a tuberculous kidney from a patient having a coexisting tuberculous bladder the tuberculous of the bladder gets well without any treatment although previous to this time you may have tried everything without effect. These hip-joint cases are similar in nature. I have treated cases of hip-joint tuberculosis in patients who have had pulmonary tuberculosis as well, and yet by treating the hip-joint disease the pulmonary condition has cleared up without any other treatment. I have statistics of my cases and of experiments on animals bearing on this, and some day I will publish them to prove my contention.

One patient for whom I removed a tuberculous testicle recovered from a pulmonary tuberculosis which existed at the time. As stated, I have made extensive experiments on animals, but have not had the time to work them out completely.

DR. A. J. OCHSNER. While I was in Professor Albert's clinic in Vienna twenty-seven years ago he showed us a case after case in which there was pulmonary tuberculosis and tuberculosis mostly of the ankle joints. He would say that if we amputate in this case, the patient will get well, but if we do not amputate and erect the tuberculous joint, the patient is likely to die. He did not give any explanation for saying this. It was simply his experience in many cases.

DR. FREDERIC A. BEXLEY. I wish to express my appreciation of the paper of Dr. Dyas, which was most instructive to all of us, and he deserves great credit for the type of work he has been doing. I believe this is another bit of evidence as to the fallacy of all antiseptic used in this way. I believe it teaches again that antiseptics used in joints or used on any surface are not capable of producing any germicidal effects on the organisms that are really doing the destructive work. These organisms are not on the surface but in the surrounding tissues, in the lymphatics and in

is impossible to use a germicide strong enough or powerful enough to in anyway inhibit the action or destroy the organisms without destroying the tissue.

His deductions as to iodoform and formalin

reducing the resistance of the tissue of the joints to infection are most logical and timely

DR. CHARLES DAVISON read a paper entitled "Treatment of Fractures by Medullary Bone Splints. (See p. 750.)

CHICAGO GYNECOLOGICAL SOCIETY

A REGULAR MEETING WAS HELD JANUARY 16, 1904, WITH THE PRESIDENT, DR. FRANK W. LYDCH, IN THE CHAIR.

DR. EUGENE CARY (in invitation) read a paper entitled "Death of a Full Term Fetus due to Constriction of the Umbilical Cord by Amniotic Bands. Rupture of the Amnion. Hydramnion." (See p. 730.)

DISCUSSION

DR. CHARLES E. PADDOCK: The report of the case by Dr. Cary being up the subject of antenatal pathology, a subject of so much interest and yet so little known. Ballantyne of Edinburgh has probably given us more enlightenment upon this important study than any one. Several journals have been established devoted entirely to subject of antenatal pathology but for lack of patronage these journals survived but a short time. The numerous articles however presented showed a widespread interest in the subject. I cannot say that cases such as the speaker has presented are rare. Personally I have not had or seen one just like it. Of course I have seen amputations and skin lesions said to be the result of amniotic band or adhesion in the early pregnancy. And as I understand it, amniotic band and adhesions, etc., the amnion belong to the neonatal period and not the fetal period; that is, they belong to teratology rather than fetal pathology. This case then is unique in that according to the speaker the amnion ruptured late due to hydramnion, and that later these amniotic bands so constricted the umbilical cord as to shut off the circulation and destroy the child.

DR. RUDOLPH W. HOLZNER: The statement has been made that a band ruptured the membrane and the amniotic fluid gradually worked its way between the membrane and the amnion and chorion and separated it *in toto*. I do not think that had any bearing on the case at all. Usually rupture of the amnion — or more commonly as we see it, rupture of the chorion — may take place because occasionally there is no coalescence whatever of the amnion and chorion and the

chorion for some reason or other may rupture with the amniotic sac, and rupture of the chorion occasionally is accompanied with the escape of a considerable amount of fluid. I think there was failure of coalescence of the amnion and chorion in this case and the baby a leg or arm might have been caught by that band, and the amnion was weak enough to permit it to be torn, when it gradually floated until it gathered up around the placenta.

DR. FRANK W. LYDCH: A paper like this is very timely in calling our attention to certain points which do not seem to be very well understood by men who have not devoted much time to this branch of medicine. Within the last few days there was a paper read at one of the special societies in town based upon some experimental work concerning fetal movements in asphyxia. I think that sometimes we lay ourselves open to criticism. Such work as has been done by Abfeld and his follower from Marburg was back in the eighties because cases of this type have not been reported. I recall what a shock it was to me when I first appreciated that my lot was to be able to tell pathologic fetuses and ova at a time when some of us were very lucky to be able to tell that they were ova and that they were pathologic due to deformity of amnion. I would like to ask Dr. Cary whether sections were made from the constricting band.

DR. CARY: No.

DR. LYDCH (resuming): This case must be unique if the literature fails to give a like example. Mention should be made of the work which Ballantyne did in his antenatal pathology and the spasmodic attempt that came out of Bohemia of work on this line in the causation of pathologic formations.

DR. PADDOCK: In 856, G. Braun reported case of this kind. Whether it reached term or not I do not know but the case was published in

French Medical Journal and in the German Journal.

DR. CARY I have quoted that case in my paper and it is the nearest in nature to the one I had.

DR. FRANK CARY I want to make one or two remarks in connection with this case. If these amniotic bands were of long duration lying free in the cavity the amnion removed from the chorion, I do not believe if they had been strong firm bands they would have broken. They were recent bands or they would not have been in that condition. I may be wrong in my supposition, but that is the way it strikes me. If the literature is correct, if this amnion had been long ruptured, the fringe of amnion left would not have been in that condition. It would have been in the condition of being curled up and more or less disintegrated. This amnion was not so disintegrated and that is why I believe it was of recent date.

DR. EUGENE CARY Dr. Paddock spoke first of these bands being arranged more like adhesions, and that is the point I want to bring out. You can get more literature on amniotic adhesions than you can cart off in an express wagon so I purposely side-tracked that part of the discussion altogether. Then he asked, Why did not the amnion rupture early and was this merely a late result? The question can be answered in several ways. First of all, these bands when the child was born were entirely free and tied around the cord but, as Dr. Frank Cary testified these bands were formed of firm tissue and the amnion that was left around the cord was perfectly free and was not thickened or changed in any way except having been torn. That, with the literature behind it, means a great deal because in all the cases reported, some two or three times the amnion was all rolled up excepting in the case reported by G. Braun in 1856. Lo vedale goes further and states that in these cases where the amnion has ruptured early the chorion becomes very much inflamed and changed, so that it cannot in some cases be stripped off the lining of the uterus. The inflammation becomes so great you cannot get it all off with a curette and the placental membranes are delivered intact without being torn without anything left behind, and the placenta is delivered spontaneously. Dr. Lynch speaks of asphyxia in these cases. If this woman had been in the hospital and waited the time this severe constriction of the cord occurred the baby with severe infection might have been saved. Jones, in one of the British journals, has written an article on the same subject in which he mentions constriction of the cord in twin pregnancy where there

was excessive movement of the twins and then all life ceased, and on delivery he found the cords of the twins had been twisted in such a way that death resulted. I wish to thank Dr. Franklin for translating the Russian article for me. I spent three months off and on going over all the literature. I went back as far as 61 followed the different clues and asked different men who were interested in this particular branch regarding these cases and I have not found any cases similar to this one except the one by G. Braun in which the amnion ruptured late and where there was constriction of the cord by amniotic bands.

DR. CHARLES S. BACON In connection with the remarks of Dr. Lynch and the closing remarks of Dr. Cary I wish to suggest the possibility of diagnosing danger to the child *in utero* and the possibility of timely interference. The part of the report that dealt with that interested me very much. Within the last ten days I have had the case of a woman who had lost two children previously one having died *in utero* a few days before term.

On account of the history I had the woman go to the hospital about ten or twelve days before labor was expected and had her watched carefully. I had the fetal heart tones counted at regular intervals every two or three hours day and night. We found variation in the heart tones of between 35 and 64. At the time when the child's movements were excessive, the woman, as having considerable distress, the heart tones were unusually rapid. The regular heart tones had previously determined to be 140. On account of the history and the fact that she had a cross presentation with breech below I made a cesarean section nearly one week before the expected delivery of the child. I found rather unusual conditions. We had very large placenta which was bipartite. The cord came off between the two sections of the placenta, but whether this had anything to do with the condition I do not know. However the practical bearing on the subject is interesting.

If it is possible in these cases of antepartum death of the child to diagnose this condition by the heart tones we may save some of these children. Just how much variation there is in the heart tones I do not know. I have not had time to look this matter up and see whether extensive observations have been made on the subject. Since this subject came to my attention a few weeks ago I have taken occasion to count the heart tones in a number of cases, and have found there is not much variation in those cases I have examined.

DR. HOLMES What caused the variation in the heart tones? Was the child endangered when you got through with the cesarean section?

DR. BACON The child was not asphyxiated. It is apparently a healthy child. The placenta was extremely large. It nearly filled the whole

entering the aponeurosis going through the round ligament and tying it over a piece of gauze, feeling I was safe, and with the silk-worm-gut suture tied the round ligament, taking the suture out after ninety days.

I would like to congratulate Dr. Cuthbertson on his ingenious operation. Speaking of the Baldy Webster operation I do not think I need to emphasize at all that there are two reasons to my mind which speak against it. In the first place it shortens the thick or strong part of the ligament. In the second place, there is constriction of the uterus. A friend of mine had a case where the uterus tipped up and there was a retroflexion carrying the round ligaments backwards. There is very little or no danger to the perineum, as I saw the aponeurosis together with my extra stitch. To a cold strangulation I now use iodine applied to the part which runs from the internal ring to the stab so that there will be adhesion formed. I never had a chance to investigate whether it was properly adherent or not, or whether there would not be a hernia at that place. I have never seen Dr. Goldspohn operate very much, he is an expert in the method he has described, but in my humble opinion in drawing up the uterus as he does there is too much tension on the ligaments, which is hardly advisable, so that the uterus is crowded naturally to the front, and we may get ventrosuspension. The top of the womb will be adherent to the incision. With the Pfannenstiel incision you can make a cross section of the aponeurosis. He does not do that, but makes a nipple there which is nice for his special way of operating.

DR. CHANING W. BARRETT The probabilities are that every person here except Mr. Whitford, who has reported so many discussions on this subject, is perfectly satisfied as to what operation he will do for retrodisplacements of the uterus otherwise if he were to operate to-morrow he would be considerably confused from all he has heard upon this subject to-night. A paper of this kind is chiefly valuable because it gives an opportunity to deal with principles and compare methods. The principles of support are that we want the uterus held forward not that the much doubted intra-abdominal pressure will fall upon the posterior surface of the uterus, but nature has decreed that animals in the upright position should not have the uterus in line with the vagina, and the vagina longitudinal with the body. Every once in a while we hear a person swear at the idea of the round ligaments holding the uterus forward, and yet they forget that nature said that and nature has said it over and over again until it

grew a round ligament for the upright animal, the round ligament being a structure developed in upright animals, and that it is for the purpose of dragging the fundus forward. We do not have to indulge in any more talk about the value of the round ligament to hold the uterus forward. The question largely is this: How shall the round ligament be used when it has once become stretched and the uterus got back in line with the vagina? Shall we use the stronger or weaker part of the ligament, inasmuch as one is stronger than the other? Some have said the poor part of the ligament is plenty good enough. When they say a thing is good enough it is abundant evidence it is *not* good enough. There is nothing that nature has made that is good enough at all times, and there is nothing in surgery that we can do that is good enough if it can be done better and so we should use the strong part of the ligament if we can, and not the weak part. I believe in the main with what Dr. Goldspohn has said I believe more fully in what he said when he talked about the principles of this work of dealing with the round ligament through the internal ring. He taught principles that are fundamental and important, but he has departed from those principles somewhat in his later years. He has gone wrong somehow. That is one of the chief arguments against the old operation of ventrosuspension in favor of bi-inguinal celiotomy, of having the ligament run through the abdomen transversely and yet the operation be proposed or follows, following the Gilliam is to run the two ligaments through the peritoneal space around which omentum or intestine can become entangled. We not only want to use the round ligament to hold the uterus forward and the very best part of the ligament, but we want it placed so it will be in a normal position. They should not run through the peritoneal space and furnish opportunities, as the Gilliam does, to entangle bowel. And so following the principles which Goldspohn and others have laid down, I devised a procedure of coming out through the abdominal wall to the ring bringing the ligaments out at the place they normally come out of the abdomen, so that there is no opportunity for bowel to become entangled around them. It is a fundamental principle that no structure should run transperitoneally.

As regards this modification by Dr. Cuthbertson when Gilliam first proposed his operation a good many of us thought it was the best operation offered the profession up to that time and I performed it for a few years, and I never knew a single one of these cases have the ligament slip out. I

idea of stab in the abdominal wall to pass such a structure through. It requires nothing of the kind. There is no stabbing done. We can take a slender artery forceps and pass it through about the middle of the sheath of the rectus, through the aponeurosis, muscle and structures within and draw the round ligament through with the same slender forceps. After having previously isolated a loop within and without any intervening loop or strip of gauze or ligature whatever, simply from one forceps to another upward and outward. As the years have gone by and the hundreds of cases have multiplied that have been subjected to this procedure, I have grown to have the feeling that this is the argument of a pettifogger to say that the uterus is strictly a pelvic organ that it should not be drawn out of the small pelvis, that it does not belong in the abdomen, and that it has no business being near to the abdominal wall. I can refute such an argument by reporting hundreds of cases. I have this feeling now as the result of what I consider mature experience, namely with about 100 cases yearly for at least ten years in which I have performed this modified Gilliam operation almost alone. I find that the ovaries are drawn out of the small pelvis, the return current of venous blood is more subjectively comfortable. The idea of being afraid to draw out of the pelvis and approximate over part of the abdominal wall an half or two inches from the border is wholly erroneous. It is much higher than that. I would incise through the rectus over the symphysis, often less, drawing up the loop of round part of the peritoneal sac crosswise from entrance of after. The lateral portion is drawn up so snugly that the space laterally from each side and the fundus is less than space. It is my belief does not enter the lower peritoneal space. Such a high intestine or intestinal once only. This was when I first tried this to draw the uterus up of intestine probably and abdominal had symptoms of disappeared how. This is the way we should

properly open the abdomen to cure retroversion because we have so many other important things to do for these cases. It is our duty to remove the appendix in practically every one of them. Such cases admit of the removal of the appendix every time. Howard Kelly was very correct when he said fifteen or twenty years ago that after the abdomen has once been opened and surgery has been done in the vicinity of the appendix, it is thereafter in greater danger of making trouble on account of adhesions to which it is apt to become subjected. Therefore, when we open the abdomen and attend to this minor retroversion work we should make an incision—or more than one—that will give us access for every other surgical act that may be called for in that abdomen. I think this intensified Gilliam operation, which secures the uterus and its adnexa on a higher plane and in pronounced anteversion is the best. Aside from my favorite bi-inguinal operation of past years, I have not discovered any procedure that will secure as much comfort as well as stable and innocent results for the patient. It can be done quickly leaving the greatest possible time for work in the upper abdomen. You can put your hand up there and if there is anything that is suspicious you can make a second incision and do what is necessary to be done.

DR. THEODORE J. DOERFLER. I was prompted by the writings of Dr. Howard Kelly in the early part of my practice to apply ventrosuspension and ventrosuspension. He was my authority then and so far as I was able to follow up the cases I never had any untoward results, but I invariably resorted to the anterior operation. I did not turn the uterus out but sewed it to the posterior part. I had one woman who continued to have trouble after that and she never had any trouble. Later I abandoned that method and for the last six or seven years I have been doing the Gilliam operation. I have had six or seven cases mostly primary cases which I have had occasion to follow up and the result was all good except in one. That was the first case I operated on which was one of ten days postpartum or post partum inflammation, the patient having come in from out of town and in that case there was recurrence. The uterus fell back. Since then I have not had any recurrence, but have had partial slipping in one case and that I attribute to the catgut I used. I sewed around through the aponeurosis to the outside with three sutures and I thought it was safe. I never saw it any thought. Since the partial slipping back I have used the Pfannenstiel incision and run that through first

uterus. This led to considerable difficulty in getting the uterus to contract.

DR. HOLMES It has been a common observation of mine that there is considerable variation in the heart tones. For instance, a woman will come into the office and when you first count the heart rate it will be one hundred twenty; you may palpate the baby and press the head and see how firm it is fixed in the brim and if you count the heart again it will be 150, 160, or 170.

DR. EUGENE CARY (closing) Referring to the case related by Dr. Bacon I have had a case somewhat similar to it. The placenta, instead of being one piece, was in two halves.

I had a case about year ago where I was called out at three o'clock in the morning to see a woman who was reported to have had severe uterine hemorrhage about an hour after the onset of labor. This day she had passed over a quart of blood up to the time they telephoned, so I hurried out there and saw the woman, who previously had had fairly large abdomen and apparently condition of hydramnios. She was apparently in labor and in good shape, and I did not examine for the fetal heart tones, because the bag of waters had ruptured and the fetal heart tones were in good condition, and I did not believe she had this enormous hemorrhage. I was finally convinced by seeing that it was not all blood but water mixed with it. It was tinged with amniotic fluid. So I was quite at loss to know where all the blood came from without concluding. There was no placenta previa or suggestion of one. The baby was delivered, was perfectly healthy and all right, and then I delivered the placenta and made an examination to see where the hemorrhage had come from, and in carefully examining the placenta it was similar to the one Dr. Bacon described. I think there was a large mass of placental tissue on the right side and on the left side there was mass about one-half that size. The blood-vessels ran out for the membranes and from there up to the cord. When the labor pains started the contractions began to stretch the membranes, the cervix was effaced, the os dilated, and the stretching was put upon the blood-vessels, and luckily for the child the membranes ruptured. One of the vessels between the cord was torn clear across, both ends were contracted, and that vessel was bleeding and giving all this hemorrhage. As long as the amniotic sac held intact the blood was forced in the amniotic fluid, but as soon as the sac ruptured the water rushed out, the uterus contracted down, the fetal head pressed against the broken end, every particle of hemorrhage ceased, labor went on normally and the child was delivered.

Dr. William Cuthbertson by invitation read a paper entitled "An Improved Gilliam Operation for Uterine Displacements" (See p. 731).

DISCUSSION

DR. ALBERT GOLDSPOHN I had thought that this subject was quite exhausted without bringing an additional modification of the transplantation of the round ligaments in the abdominal wall yet other men have a right to their opinions, and if we are to have one more modified operation, all right, as long as the fundamental principle that

governs all these operations is correct, viz., that you deal with the thick end of the round ligament to do service, and not make the mistake that is made in the Baldy-Webster operation and that of Dr. Ries, whose technique is anatomically wrong because it places dependence upon the terminal, useless, outer end of the round ligament to do good or to hold and this it can not do.

Practically all men except a few general surgeons like Dr. Coffey are agreed that the round ligament is the thing that we can rationally use and depend upon and the argument of some of the pettifoggers to the effect that the round ligament does not serve to hold the uterus for ward is a weak one. We do know that it does something in that direction, but how much we do not know and I do not care. If the round ligament up to the time of the operation has had no function, there is nothing at all in opposition to my giving it a function. It will give good service. That, all the gentlemen know who deal with the round ligament in the right way. There are a dozen different ways of making an efficient transplantation of the median useful end of the round ligament into the abdominal wall. The Montgomery, Noble, Barrett, and many other modifications of the Gilliam operation are all correct, in my judgment, in that they make use of the thick end, the uterine part only of the round ligament to do service. They make it serve by changing its course and securing a new attachment for it and ignore the outer end. In the main these operations are all of a substantial character, but there are differences. They are not all equally applicable to various kinds of cases. For instance, if you want to do the operation of my friend here, Dr. Barrett, on a patient who has had a severe pelvic peritonitis, if the broad ligaments and round ligaments are thoroughly infiltrated, and you want to separate or isolate the round ligament to such an extent as is necessary to draw the loop as far laterally as the location of the internal abdominal ring and from there out in the abdominal wall, you will not be able to do it and this he has admitted himself. But it is a different thing if you simply pick up enough of a loop to pass directly straight forward through a blunt puncture, not as far as Dr. Cuthbertson goes, but say about an inch laterally from the median incision, through the rectus muscle and aponeurosis and anchor it in these firmer structures. This can nearly always be done. Dr. Cuthbertson proposes to make the attachment to the aponeurosis of the external oblique, which is much weaker and in some women will be a rather delicate thing. Some objections have been made to the

idea of stab in the abdominal wall to pass such a structure through. It requires nothing of the kind. There is no stabbing done. We can take a slender artery forceps and pass it through about the middle of the sheath of the rectus, through the aponeurosis, muscle and structures within and draw the round ligament through, with the same slender forceps after having previously isolated a loop within, and without any intervening loop or strip of gauze or ligature whatever simply from one forceps to another upward and outward. As the years have gone by and the hundreds of cases have multiplied that have been subjected to this procedure, I have grown to have this feeling that it is the argument of a pettifogger to say that the uterus is strictly a pelvic organ, that it should not be drawn out of the small pelvis, that it does not belong in the abdomen and that it has no business being near to the abdominal wall. I can refute such an argument by reporting hundreds of cases. I have this feeling now as the result of what I consider mature experience namely with about 100 cases yearly for at least ten years in which I have performed this modified Gilliam operation almost alone. I find that the higher the ovaries are drawn out of the small pelvis the better is the return current of venous blood, and the more subjectively comfortable is the patient. The idea of being afraid to draw the fundus uteri out of the pelvis, and approximating it to the lower part of the abdominal wall an inch and one-half or two inches from the border of the symphysis pubis, is erroneous. It is a mistake to go much higher than that. I would not make these punctures through the recti or two inches away from the symphysis, often less, and the method of drawing up the loop. I found ligament occludes the part of the peritoneal cavity below that point crosswise from entrance of intestine into it thereafter. The lateral portion of the round ligament is drawn up so snugly that it effectively occludes the space laterally from the point of anchorage on each side and the fundus uteri closes the median space. It is my belief that the intestine does not enter the lower inch and one-half of peritoneal space. Such a thing as interference with the intestine or intestinal obstruction I have seen only. This was about fifteen years ago when I first tried this operation. I was afraid to draw the uterus up high enough and a knuckle of intestine probably worked down between the fundus and abdominal wall and later the patient had symptoms of intestinal obstruction. These disappeared forever without surgical intervention. This is the only case of the kind I ever saw. We should

properly open the abdomen to cure retroversion because we have so many other important things to do for these cases. It is our duty to remove the appendix in practically every one of them. Such cases admit of the removal of the appendix every time. Howard Kelly was very correct when he said fifteen or twenty years ago that after the abdomen has once been opened and surgery has been done in the vicinity of the appendix, it is thereafter in greater danger of making trouble on account of adhesions to which it is apt to become subjected. Therefore when we open the abdomen and attend to this minor retroversion work we should make an incision—or more than one—that will give us access for every other surgical act that may be called for in that abdomen. I think this intensified Gilliam operation, which secures the uterus and its adnexa on a higher plane and in pronounced anteversion is the best. Aside from my favorite bi-inguinal operation of past years, I have not discovered any procedure that will secure as much comfort as well as stable and innocent results for the patient. It can be done quickly leaving the greatest possible time for work in the upper abdomen. You can put your hand up there and if there is anything that is suspicious you can make a second incision and do what is necessary to be done.

DR. THEODORE J. DOZIERLIN. I was prompted by the writings of Dr. Howard Kelly in the early part of my practice to apply ventrosuspension and ventrofixation. He was my authority then and so far as I was able to follow up the cases I never had any untoward results but I invariably resorted to the anterior operation. I did not turn the uterus out, but sewed it to the posterior part. I had one woman who was confined twice after that, and she never had any trouble. Later I abandoned that method and for the last five or six years I have been doing the Gilliam operation. I have had six or seven cases, mostly private cases, which I have had occasion to follow up and the results were all good except in one. That was the first case I operated on which was one of extensive puerperal or post-partum inflammation, the patient having come to me from out of town, and in that case there was a recurrence. The uterus fell back. Since then I have not had any recurrences, but have had a partial slipping in one case and that I attributed to the catgut I used. I sewed around through the aponeurosis to the outside with three sutures and I thought it was safe. I never gave it any thought. Since the partial slipping back I have used the Pfannenstiel incision and run that through first

entering the aponeurosis, going through the round ligament and tying it over a piece of gauze feeling I was safe, and with the silkworm-gut suture tied the round ligament, taking the suture out after ninety days.

I would like to congratulate Dr. Cuthbertson on his ingenious operation. Speaking of the Baldy Webster operation, I do not think I need to emphasize at all that there are two reasons to my mind which speak against it. In the first place, it shortens the thick or strong part of the ligament. In the second place, there is constriction of the uterus. A friend of mine had a case where the uterus tipped up and there was a retroflexion carrying the round ligaments backwards. There is very little or no danger to the perineum, as I sew the aponeurosis together with my extra stitch. To void strangulation I now use iodine applied to the part which runs from the internal ring to the stab, so that there will be adhesion formed. I never had a chance to investigate whether it was properly adherent or not, or whether there would not be a hernia at that place. I have never seen Dr. Goldspohn operate very much, he is an expert in the method he has described but in my humble opinion in drawing up the uterus as he does there is too much tension on the ligaments, which is hardly advisable, so that the uterus is crowded naturally to the front, and we may get ventrosuspension. The top of the womb will be adherent to the incision. With the Pfannenstiel incision you can make a cross section of the aponeurosis. He does not do that, but makes a nipple there which is nice for his special way of operating.

DR. CHANNING W. BARRETT: The probabilities are that every person here, except Mr. Whitford, who has reported so many discussions on this subject, is perfectly satisfied as to what operation he will do for retrodisplacements of the uterus otherwise, if he were to operate to-morrow he would be considerably confused from all he has heard upon this subject to-night. A paper of this kind is chiefly valuable because it gives an opportunity to deal with principles and compare methods. The principles of support are that we want the uterus held forward, not that the much doubted intra-abdominal pressure will fall upon the posterior surface of the uterus, but nature has decreed that animals in the upright position should not have the uterus in line with the vagina, and the vagina longitudinal with the body. Every once in a while we hear a person sneer at the idea of the round ligaments holding the uterus forward, and yet they forget that nature said that, and nature has said it over and over again until it

grew a round ligament for the upright animal, the round ligament being a structure developed in upright animals, and that it is for the purpose of dragging the fundus forward. We do not have to indulge in any more talk about the value of the round ligament to hold the uterus forward. The question largely is this: How shall the round ligament be used when it has once become stretched and the uterus got back in line with the vagina? Shall we use the stronger or weaker part of the ligament, inasmuch as one is stronger than the other? Some have said the poor part of the ligament is plenty good enough. When they say a thing is good enough it is abundant evidence it is *not* good enough. There is nothing that nature has made that is good enough at all times, and there is nothing in surgery that we can do that is good enough if it can be done better and so we should use the strong part of the ligament if we can and not the weak part. I believe in the main with what Dr. Goldspohn has said. I believe more fully in what he said when he talked about the principles of this work of dealing with the round ligament through the internal ring. He taught principles that are fundamental and important but he has departed from those principles somewhat in his later years. He has gone wrong somehow. That is one of the chief arguments against the old operation of ventrosuspension in favor of bi-inguinal celiotomy, of having the ligament run through the bottom transperitoneally and yet the operation he proposes or follows, following the Gilliam, is to run the two ligaments through the peritoneal space around which omentum or intestine can become entangled. We not only want to use the round ligament to hold the uterus forward and the very best part of the ligament, but we want it placed so it will be in a normal position. They should not run through the peritoneal space and furnish opportunities, as the Gilliam does, to entangle bowel. And so following the principles which Goldspohn and others have laid down, I devised a procedure of coming out through the abdominal wall to the ring bringing the ligaments out at the place they normally come out of the abdomen, so that there is no opportunity for bowel to become entangled around them. It is a fundamental principle that no structure should run transperitoneally.

As regards this modification by Dr. Cuthbertson when Gilliam first proposed his operation a good many of us thought it was the best operation offered the profession up to that time, and I performed it for a few years, and I never knew a single one of these cases have the ligament slip out. I

have never known one of these patients to return after the operation was performed on account of a recurrence of the displacement but I have seen conditions that were pathologic from that procedure. The doctor spoke of the operation which I have devised as furnishing an opportunity for the ligaments to become loosened and to slip. I have performed that operation for ten years, and I have never known a single case in which I thought the ligament gave way and went back into the abdomen. Dr Goldspohn usually in discussing this lays some stress upon the trauma the operation produces. From the standpoint of trauma we have in mind two things. While once in a while we will have a hematoma by coming out at the external ring and bringing the ligament through the internal ring and once in a while we will have a hernia, I must say that in ten years not a single hernia or hematoma has occurred. When I read a paper nine years ago on this subject and Dr Goldspohn discussed it, he said it was theory. It is a fact, now that we do not have these things occur so that whether one chooses for the operation opposing ligaments, which is the method which furnishes greater trauma and produces more injury to tissue and necessitates greater work, or whether we simply do the method of fastening as Gilliam has proposed I do not see that there is any great point here because the ligament has not given way. In regard to the incision, if we examine the charts of Dr Cuthbertson and we are to judge from the size of the ligaments shown, the size of the longitudinal incision, the size of the forceps, etc. this is minimized from the normal size, and yet if that incision is equally minimized, I should hardly suggest that as a method of operating for retrodisplacement of the uterus.

DR. N. S. HEANEY. Dr Goldspohn spoke about one case in which he had strangulation in the lateral loop of round ligament but which did not require operation. I would like to know how he made the diagnosis of strangulation of the gut through the lateral loop.

DR. CHANNING W. BARRETT. Reference was made to the point that in cases of infiltration the ligament cannot be taken out through the ring. I have always taught that the procedure of shortening the round ligament in that way could not be done in cases of infiltration, and I observed that precaution in doing the Gilliam operation and I should likewise observe it if I were going to do the Gilliam operation at the present time. The Gilliam operation or the shortening of the round ligament through the ring, is not at all fitted for those cases that have infiltration and a mild

sepsis such as he speaks of. Neither one of these procedures should be done in such a case.

DR. ALBERT GOLDSPORN. Dr Barrett did not listen to what I said. There is practically no space left in front of the uterus between it and the bladder. I have had occasion to open up some of these women again for other pathologic conditions, and I am prepared to say that the intestine does not enter below my approximation to the abdominal wall. If that is true there is no such thing as snaring by the two ligaments, because the intestines do not pass below or around them. Nor will the fundus uteri become adherent to the abdominal wall merely from contact with it, if we do clean surgery. In the matter of infiltration of the round ligaments, I should be very sorry if I had to back down, and forego the use of the round ligaments entirely because of such infiltration for only some barbarous fixation then would remain available. Not so with my use of the round ligaments, for they still serve best even in the borderline cases in which the most extreme use of conservative surgery on the adnexa is made use of to save or to restore a small prospect for conception. In these cases, a ligament will occasionally tear off. An Olshausen fixation of the cornu is then made. The round ligaments must not be dissected out from their peritoneal envelope but this—i.e. the upper part of the broad ligament—must be freely made use of with the round ligament in order to close off the lower part of the abdominal space as above described and to secure stable results.

DR. HEANEY. You have not answered my question.

DR. GOLDSPORN. In the first place it was something like ten days after the operation when the patient had intestinal obstruction. There was no doubt about that and there might be a question whether the passage of the bowel had occurred in the median line between the fundus and abdominal wall, or whether it had occurred in one of the lateral portions over a round ligament. But in those days I was afraid to draw the uterus up as much as I do now and there was more space between the fundus in the median line than there was laterally. Any one could see that by the way we draw the loops up. That is my reason for it. So far as hernia and recurrence of displacement are concerned I will take the challenge from anybody. I do not wait on obstetric cases very much but my assistants attend to this work largely in this city. From them and from practitioners outside as well as from patients themselves, I am pretty well informed about the remote results in these cases. If anything serious

happens in connection with the operation I have done I am quite sure to learn of it. There are no herniae. A return of the displacement after this operation—there may be one case in two hundred, although I know of only two cases and the percentage of recovery to health and comfort is equalled only by that glorious operation that I used to do—bi-inguinal celiotomy.

There were twelve years during which I made the *extended Alexander operation* fit nearly all the retroversions complicated with adhesions and diseased adnexae (short of pus tubes). I liberated adhesions and resected or removed individual tubes and ovaries and shortened the round ligaments most ideally through the simply dilated internal inguinal rings and canals.

In the hands of some twenty operators in America and Germany about eight years ago this procedure and other types I thoroughly modern Alexander operations counted nearly three hundred cases who had borne one or more children after their operation with only about ten cases of recurrence of displacement. So crucial a fire of scrutiny and criticism all other retroversion operations together have never passed through. If retroversion were all that requires surgical treatment in the abdomen of women who have this disorder then I would be doing this same bi-inguinal operation this day.

DR. WILLIAM M. THOMPSON: The last word on retrodeviations of the uterus has not yet been said. The real crux of Dr. Cuthbertson's paper it seems to me, has been overlooked by the previous speakers, and that is the utilization of this tendon, or aponeurosis of the muscle and the strong point in that is that it does not constrict the ligament. I think most of those men who draw up the ligament, tie it securely and sometimes too securely and in that way cut through the ligament, destroy its function and the point made by Dr. Cuthbertson is that he deals with the utilization of this tendon or aponeurosis of the muscle for a suture.

DR. N. S. HEANEY: I have been following the Webster operation, which utilizes the uterine end of the round ligament. We have been very well satisfied with our results.

Dr. Polak recently published a paper in which his results following the Webster operation were not encouraging from our viewpoint, chiefly we believe, because he performs it in a different way. Although those men who do the Gilliam operation have never seen strangulation of the gut, I who never have done this operation have seen strangulation of the intestine in two cases, one confirmed by autopsy and the other by operation and I

have heard of strangulation of the gut occurring in the practice of others. While I believe that the extreme outer end of the ligament theoretically is the better part to shorten up I don't believe that it is a matter of much practical importance and we expect to continue to use this method in the majority of our retroversion operations.

DR. MARK T. GOLDSTEIN: As has been said by Dr. Heaney you cannot pass upon an operation you have never done. The Webster-Baldy operation has been found satisfactory in the gynecological service at Wesley Hospital, and most of the general surgeons are using it, and Dr. Webster, Dr. Baldy and Dr. Andrews are not responsible for every man's technique who tries to do that operation so that if the uterus tips backward, they should not be criticized. A word about the Watkins-Wertheim operation. It is not primarily an operation for shortening the round ligaments by the vagina. Dr. Watkins shortens the round ligaments that way but his operation is devised for extensive prolapse and cystocele and not for shortening of the round ligaments. Furthermore, we are not of the opinion that shortening the round ligaments in correcting retroflexion will cure cystocele. We look upon cystocele as a hernia of the bladder and by dealing with the ligaments and doing anterior colporrhaphy you will get results. The Webster operation has been constantly successful with us, and is consistent with pregnancy. I have worked that part out and studied it carefully for Dr. Watkins, and we are satisfied with the results we get in pregnancy following the operation. Sometimes after shortening the round ligaments we advance the peritoneum of the bladder up to the top of the fundus of the uterus, and suture the broad ligament to the uterus where it comes through so that it is only a slight modification.

DR. CHAUNCEY W. COURTRIGHT: I feel that the Barrett operation as he describes it, suits me better than any of the other methods with which I am familiar. I have seen many of these operations performed by different men, each with a little variation in technique, and yet, after all, it does not depend so much upon the strength of the round ligament as great many would have us believe. However I believe a mechanical principle obtains here as anywhere else, namely, if the uterus can be brought forward and held there there is no reason why it should go back. If there are adhesions present they must be looked after. If the uterus is put in such a position that viscera will fall down behind it, there is no reason why it should require a suture to hold the uterus

forward. I have heard it said to-night and emphasized that we should utilize the stronger portion of the round ligament. The question arises, Which is the stronger portion? Who has demonstrated it? Who has demonstrated which is the stronger portion of the muscle the tendon or the belly of the muscle. The fleshy part of the round ligament to my mind is more likely to give way than the tense fibrous part which is smaller but fully as strong. In other surgical departments we look for a break in the muscle not in its tendon but in the belly of the muscle. I have had the biceps fracture in the middle but never found a tendon fractured from traction or tension or pulling. I am not convinced that the stronger portion of the ligament is the more durable or permanent part of the round ligament and that it is the only part to use in bringing the uterus forward and holding it there.

Dr. LOUIS FISCHMAN. We hear a good deal about the Gilliam operation and of strangulation of the intestine following it. Dr. Heaney said he knows of two cases of strangulation of the intestine following this operation and there are other cases reported in the literature although Gilliam himself denies this. He says that in all cases in which strangulation has taken place the round ligaments have run through unincised or transperitoneal space. In order to avoid this defect, Dr. Barrett has devised his operation of bringing the round ligament out through the abdominal ring and of raising it to fill all the requirements of the Gilliam operation itself and does away with the undesirable defect of incising the peritoneal cavity. It produces normal conditions in that the round ligament should normally run outward from the pelvis upward, while with the Gilliam operation the round ligament so that in the Barrett operation the uterus is supported by the round ligament in forward and outward direction.

Dr. Gold points out that if we pull the uterus far enough forward it will come through the defect. Personally I have had experience with the Gilliam operation but I have had experience with the operation in that Dr. Barrett has described in working with him. I am now sick and the result has been satisfactory. I see in the cases in which the Gilliam operation was done and the uterus brought well forward that the patient simply did not feel any irritation. I think I should like to try the Gilliam operation. Dr. Webster said that the requirement of a patient going through pregnancy with out any trouble and the uterus remain in position after delivery has been secured by Dr.

Barrett's patients who have gone through pregnancy and labor as we have had the privilege of examining them subsequently, and we have found the uterus in its proper position. I have seen one case that has gone through two pregnancies and the uterus has remained in good position. Personally I have two cases that have gone through pregnancy and the uterus is still in good position.

Dr. Heaney spoke of the weak and strong part of the round ligament. There is no question at all that the uterine end contains considerable muscle and as we go out towards the internal ring the musculature disappears and becomes fibrous. Early in my medical career I learned that a scar is the weakest part in the body and I still believe it, and the outer end of the round ligament is fibrous tissue the same as a scar and I should say would stretch much quicker than the belly of the muscle so that while the Webster-Haldy operation or the Andrews-Webster-Haldy operation may give good results, it is the operation that utilizes the poor part of the ligament which is the better.

Dr. FRANK W. LYNN. There is a great similarity about these operations. In fact no matter which one of the numerous operations you perform there are successes and there are failures. It really seems that failures depend upon not how much we drag the uterus forward but how we keep the cervix back at the same time we keep the uterus forward. I have known Kelly operation to be successful, and they are nothing but films of tissue and scar tissue. They do not do very much to ward hold the uterus forward. It depends very largely upon the uterus which must be at the base of the broad ligament and if we have good pelvic floor it does not make much difference what operation we do. I am a little sceptic because I do not believe these displacements alone require much if any treatment. I do not believe we should operate upon these cases unless the uterus is enlarged or the patient has a prolapsed ovaries or some thickening. Some of these patients do not complain of symptoms. I like to read papers by men who emphasize the point that the recurrences are frequent from practically any operation if we do not put our uterus in. We should all emphasize the fact that a pessary should be used where there has been plastic work done to keep it in position.

Dr. CLAUDE F. LUTHER. I am glad Dr. Barrett has been able to mark. I have seen many cases followed but with operation but I am interested to check and determine the

uterus, yet by supporting the uterus with a proper fitting pessary for a few weeks or months the operation was no longer indicated. It would be interesting to know from these gentlemen who find so many displacements calling for operation just what percentage had had similar treatment.

Dr. LYNCH I meant the use of pessaries after operations.

Dr. CHANNING W. BARRETT I thought this ground had been covered until the last speaker had talked. They have not struck the right operation. When a person gets up and says that all of these operations are alike and that there are a number of cases in which recurrence of the retro-deviation has taken place it is perfectly evident the right operation is not being done, because patients who undergo these operations are entitled to something better than that vague sort of thing. As regards the use of pessaries, I would say that an operation that is done properly for holding the uterus is not going to require the use of pessaries to hold that organ in position. Dr. Pad-dock is dealing with obstetric cases and there are obstetric cases that have retrodisplacements which require a pessary or support to hold the uterus in proper position during the early weeks or months after confinement and if the patient has a good pelvic floor the practitioner will have success in keeping the uterus forward. On the other hand, in the gynecological cases where the retrodisplacement has gone on for months, the practitioner will not meet with success with any line of pessary treatment that can be carried out, because we have tried it and have failed.

Dr. N. S. HEAVY If Dr. Barrett has never seen a recurrence after his operation it is because he has not done a sufficient number of them, for if retroversion occurs occasionally in those who have previously been normal, what is to prevent its occasional recurrence after operation? Because a woman has a recurrence after labor is also not proof that the operation was not properly performed or was not the proper type of operation since we all know that a pregnancy causes most retroversions and displacements. It is not the fault of the operation, but it is a thing liable to happen after confinement, no matter whether the woman has had an operation or not.

Dr. ALBERT GOLDSPOHN I have made observations on what can be done with pessaries in the puerperal uterus, on a small number of cases. My conclusion so far is that if we take the average labor case (not the one where there has been severe infection), examine her two weeks post partum, and on finding a retroversion, order her to assume the knee-chest posture two to three

times daily for five to fifteen minutes, and to sleep in a Sims' position at night. A week later the uterus having been secured in anteversion by the assistance of the knee-chest posture if necessary fit a pessary large enough and of right shape to hold the uterus from turning over backwards again, and have the patient continue the posture treatment of herself, as before. In the meantime a doctor is able to correct a retroversion — bi-manually should examine the case from once a week to once a month, changing and introducing gradually smaller pessaries, so that the uterus is never permitted by its weight in retroversion to pull upon the idle recuperating round ligaments for about a year then the case will be cured in a very high percentage of such attempts, — provided that the first six to eight weeks of this course of treatment occur before the physiological period for involution of the uterus and of its members — the round ligaments — is past after that the cures by pessaries are possibly one or two per cent only.

Dr. ROBERT T. GILLMORE I think prophylaxis in connection with the question of retroversion of the uterus is an important factor and I am surprised that obstetricians have not recognized the importance of posture in the prevention of retroposition. In the absence of complications of an inflammatory nature it is well to have the patient lie on the stomach and use the knee-chest position the sixth to the ninth day after labor. The uterus is usually so big that it will not drop back until after the sixth day. I have done that as a routine measure for the last ten years, and have had very few cases of retroflexion of the uterus after labor. In reference to the use of the pessary after labor I do not think it should be used for at least five weeks, on account of the possibility of introducing infection.

The point brought up by Dr. Lynch in regard to keeping the cervix back in its normal position in the hollow of the sacrum is very important, and if it is back there we would not have so many retroflexions as we have. Of course, I am speaking now of gynecological retroflexions in which there are always symptoms of some complications that suggest some of the operations for the retroflexion. In other words, there are distinct indications for the use of the pessary that these indications are clear to every gynecologist and I believe the pessary should be used more frequently than it is by gynecologists. I have had good results in cases of marked subinvolution of the uterus that had gone through labor by a properly fitting pessary and by keeping track of those

patients for some years, the uterus had remained in the correct position and the uterus was almost normal in size.

I do not believe in operating for retroflexion unless it produces symptoms or complications such as salpingitis or inflammation of ovaries or fixation of the uterus backwards in which the adhesions have to be broken up. If there are no adhesions, so that the uterus can be put in normal position, we will get good results from the use of a pessary.

DR. LOUIS FRIEDMAN. We hear of a good many cases of retroversion that occur shortly after labor that can be benefited by prophylactic measures, by non-operative means. I have seen a number of post-partum cases in Dr. Barrett's clinic that have been treated by the measures outlined here the knee-chest position, and copious hot douches. There is one thing we have in these cases that has not been mentioned, and that is, we usually have subinvolution of the uterus and all the pelvic organs together with the ligaments of the uterus, and there is a decrease in the weight and size of the uterus by the hot douches and the use of glycerine and ichthyol tampons. If we proceed with these means for from four to six weeks, we can allow proper involution of the round ligaments by righting the uterus with a pessary. Dr. Gillmore raised the question of using pessary in cases in which we have a freely movable uterus. We know that the uterus favors a malposition. If the malposition is not complicated by some pathologic condition and produces practically no symptoms, it makes very little difference to the woman whether her uterus is in this or that position but as a result of retroversion sooner or later there will develop pathology which will call for operative treatment. We know as Dr. Goldspohn and others have said, a pessary will cure cases that have subinvolution of the uterus plus the pelvic tissues. On the other hand, a pessary will never cure cases that are chronic, that have gone on for three months past labor

because in those all the involution has taken place that will occur and the pessary there acts as a mechanical agency to hold the uterus in position we have to use it as long as the patient lives.

DR. FRANK W. LYNCH. I fear I have been misunderstood in the use of pessaries. I meant to say if I did not say so, pessaries after operation and not after labor. I use a pessary in my cases for six or eight weeks after operation to take the strain off of the sutures.

DR. WILLIAM CUTBERTSON (closing). I am sorry I did not read my paper. I am very glad Dr. Thompson called attention to the fact that the crux of my paper was in the method of anchoring the round ligament. Every man seems to be satisfied with the operation he does for the cure of retrodisplacements. I agree thoroughly with Dr. Barrett that up to the time I devised this modification the correct operation had not been done. I am very much pleased to hear men of wide experience, like Dr. Goldspohn and the majority of those who discussed my paper agree that the use of the round ligament is the proper means of correcting these displacements. I will not attempt to reply to the individual discussants, but merely call attention to the fact that I do not anchor the round ligament to the aponeurosis of the external oblique but I make use of a strip of the external oblique with which to support and fasten the round ligament in its new position. In regard to the trauma of this operation I have used the Gilliam operation. I used to do ventrosuspension and ventrofixation and I find that of all the extra-abdominal treatments of the round ligaments, the operation I have reported here causes as little trauma as any of the others in which the ligament is brought forward. Replying to the remarks of Dr. Lynch with regard to the support of the pelvic floor, I have stated in my report of the operation that where the pelvic floor is destroyed, I have repaired it in order to give the uterus the added support which its natural structure affords it in a normal condition.

BOOK REVIEWS

A CRITIQUE OF NEW BOOKS IN SURGERY

By M. G. SEELIG M. D., SAINT LOUIS, MISSOURI

IN a recent issue of *The Nation* Professor Hiram Bingham of Yale, writing of the late Adolphe Alphonse Blandin, the great American anthropologist, says, "It may have been due to his Swiss ancestry that his literary product seemed to combine German patience and thoroughness, with an originality and brilliancy that is French. One wonders what added qualifications Professor Blandin would have attributed to an English strain in Blandin's ancestry—possibly clarity of thought and force of expression. At all events it will be interesting to note in the books that lie on the table for review (and it happens, accidentally that French, German, and English ones lie side by side) whether there is a characteristic national flavor as pronounced in type in the medical as in the literary product of these countries."

Der Chirurgische Kursus by Schmieden, would be characterized by you as a typical German product and largely for the reason that it mirrors patience and thoroughness. It is a volume intended solely for the teaching of operative surgery as an art separate and distinct from the science of surgery. There are four hundred pages, divided into eight sections, devoted respectively to ligation of arteries, resection of joints, amputations and excisions, operations on the extremities, operations on the head and neck, operations on the chest and trunk, abdominal operations, and operations on the urogenital system.

Written primarily for students, in their work on the cadaver there is no call for citations from literature or extended discussions regarding the merit or demerit of various operative attacks. Indeed, one of the inherent excellencies of the book is the consummate care with which typical operative procedures are selected and described, step for step with only those anatomical annotations necessary to the performance of intelligent work. One notes, however with somewhat of a rude shock, that in describing the radical operation for carcinoma of the breast, Schmieden deliberately (both in his description and in his illustration) places the incision so that it runs directly through the axilla.

No small part of the value of the book resides in the four hundred and fifty-odd illustrations. The Germans of late have adopted a type of combined pencil, crayon, and wash work illustration which, by

the judicious admixture of a little red and brown color and the use of a semigloss paper produces a remarkably artistic effect without sacrificing clearness or detail. These very illustrations in themselves furnish evidence of the patient care and thoroughness that we have characterized as Teutonic. From this point of view the volume is an exemplar even though it be not epochal.

NOW the French volume, by way of contrast, mirrors in no sense of the word the brilliancy or originality attributed by Professor Bingham to French literary products. True it deals with a subject that hardly permits of the display of either of these qualities, but nevertheless it weakens doubts in the minds of those who follow French medical literature of to-day as to whether or not there really exists anywhere in modern French medicine brilliancy and originality even approximating that displayed, let us say, by Charcot, Louis, or Pasteur (himself not a physician).

Loomis and Hahn have treated their subject in three parts. Part I is devoted to the armamentarium of the radiologist and in eleven chapters discusses the properties of the X-rays, the installation of apparatus, the various types of tube supports, tubes, examining tables, screens, intensifiers, and developers. This part of the book is carefully worked out but, naturally makes stronger appeal to the technical roentgenologist than to the clinician.

Parts II and III are devoted entirely to the clinical side of radiology and discuss the interpretation of X-rays of bones and joints, the location of foreign bodies, the examination of the head, chest, and abdomen, and finally the therapeutic application of the X-ray. None of the contents of this second and third part of the volume furnishes new data. For the most part the material is well assembled, but there are omissions so weighty as to lessen the value of the entire work. No mention is made, for example, of ureter catheterization (with an opaque catheter) in locating ureter stones, and the very important subject of diseases of the duodenum is dismissed in four or five lines.

All in all, the book stands rather as an attempt to expound a knowledge of radiology in fairly full compass but it misses out not only in that the expected French brilliancy and originality play no part in its

DER CHIRURGISCHE KURSUS VON Schmieden. Von Viktor Schmieden.
Dritte Auflage. Johann Neuber, Leipzig, 1914.

PRÉCIS DE RADIOLOGIE PRATIQUE. Par A. Loomis et C. Hahn.
Revised by Edouard Scherrenberg et M. Hahn. Paris, 1914.

composition, but also in that there is scanty evidence of the plotting thoroughness that Walker meets with in the good German prose classic.

THE English claim to trust to the English. Although Walker specifically states in the preface that his object is to produce a text-book of English, the book is so broad—a book that would reflect current opinion of the day and at the same time bear the impress of the experience and long personal bias of the author—that he has succeeded in doing for general literary survey what Dr. Costa has done for general survey with his text-book. When we say that Walker has maintained the English ideal, we mean that he has logically classified his data, carefully edited it, and then presented it with the best of effort that practically all his characteristics of good English expository writing. The simple clear English is not overdone with a wealth of carefully planned illustrations that in analysis illustrate.

The book is divided into eleven chapters, which discuss in order: 1. The sentence, 2. The paragraph, 3. The section, 4. The chapter, 5. The book, 6. The style, 7. The language, 8. The literature, 9. The history, 10. The science, 11. The art. Each subject is introduced with a suitable introduction, and the subject is treated in a logical and systematic manner. The treatment is described in a logical and systematic manner.

For the purpose of the book, the author has made a selection of the best of the English literature, and the treatment is described in a logical and systematic manner. The treatment is described in a logical and systematic manner.

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solution so highly recommended by the English by the English.

It is well known that the English language is one of the most important in the world. It is the language of the most powerful nations, and it is the language of the most important literature. It is the language of the most important science, and it is the language of the most important art. It is the language of the most important history, and it is the language of the most important philosophy. It is the language of the most important religion, and it is the language of the most important politics. It is the language of the most important law, and it is the language of the most important medicine. It is the language of the most important agriculture, and it is the language of the most important commerce. It is the language of the most important industry, and it is the language of the most important science. It is the language of the most important art, and it is the language of the most important philosophy. It is the language of the most important religion, and it is the language of the most important politics. It is the language of the most important law, and it is the language of the most important medicine. It is the language of the most important agriculture, and it is the language of the most important commerce. It is the language of the most important industry, and it is the language of the most important science.

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IN its consistent attempt to correlate pharmacologic actions with physiologic functions the work of Meyer and Gottlieb is unique among text books on pharmacology. In the authors' state in the preface they have divided the drugs into two classes, organotropic (those influencing organs or their functions) and eliotropic (those acting on the causative agents of disease) and have thought it best to describe and analyze the organotropic pharmacological actions separately for each organ or function. The result is that instead of the stereotyped chapter headings of Aconite Bromides Caffeine Digitalis or Antipyretics Bitters Cathartics Diaphoretics we find chapters devoted to the Pharmacology of the Central Nervous System Pharmacology of the Digestion Pharmacology of the Circulation Pharmacology of the Eye and so on. For example the various actions of atropin and its congeners are not grouped together but are to be found in the chapters on the central nervous system, vegetative nervous system, eye digestion, circulation, respiratory system and secretion of sweat. In the treatment of each confusing subject as pharmacology this method seems ideal and it has been consistently followed throughout.

The author has added much to the value of the book by prefacing each chapter with an epitome of the physiology of the function under discussion. These summaries are particularly lucid in the chapters on the vegetative nervous system circulation and renal function.

Much work has been done in this recent year to determine the extent to which the chemical constitution of a given drug affects its pharmacologic action. Evidence of this is seen throughout the book, perhaps being nowhere more clearly brought out than in the discussion of cocaine and its synthetic substitutes.

The treatment of each entirely practical subject as an anesthetic, management of circulatory failure and diuretics is admirable. There is thorough presentation of the experimental facts and theories of digitalis action but this is unfortunately not balanced by a discussion of digitalis therapy (the various clinical aspects of diseases of the heart).

The chapter on Etiotropic Pharmacological Agents includes Antiseptics Anthelmintics, Crescots in Tuberculosis Quinine in Malaria Salicylates in Rheumatism Arsenical Compounds in Protozoal Diseases Mercury in Syphilis Tetraculin and Serum Therapy.

In the last chapter on "Factors Influencing Pharmacological Reactions" we find an able discussion of important topics such as Relation between Size of Dosage and Intensity of Effect Functional Condition of the Organs Antagonism Dislocation Immunity Synergism Hypersusceptibility and Anaphylaxis.

The full index to the volume precludes any criticism of the method of presenting in connection with the various bodily functions the facts concerning a given pharmacologic agent even though this scatters the facts throughout several chapters.

There seems to be too much of a tendency on the part of the authors to accept without comment the unconfirmed statements of investigators relative to certain drug effects but this is in many cases corrected by the terse subjoined notes of the translator who has here and there throughout the volume inserted remarks of much practical value. The translator furthermore deserves much credit for the evident care with which his part of the work has been carried out.

This book should prove of greatest value to the scientific biologist and physician, who is well grounded in normal and pathologic physiology and whose experience should prevent his too ready acceptance of statement of superficial observations or of their reputed clinical significance. The value of the book is further enhanced by bibliography appended to each subject.

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BOOKS RECEIVED

Book received are acknowledged in this department and such acknowledgments must be regarded as sufficient return for the courtesy of the sender. Selections will be made for review in the interest of our readers and as space permits.

1. *STUDY OF MEDICAL LIBRARY*. Edited by C. C. Chen and B. C. M. D. F. R. C. S. and J. Martin Beattie M. A. M. D. C. M. Three volumes. Price \$7.00 per volume. New York City: Funk & Wagnalls Company. 94

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Clinical Congress of Surgeons of North America

FIFTH ANNUAL SESSION

LONDON ENGLAND

WEEK OF JULY 27 1914

THE LONDON COMMITTEE

Honorary Chairman SIR RICKMAN J GODLEE

Honorary Secretaries MR. HERBERT J PATTERSON MR. HERBERT S. PENDLEBURY

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Charing Cross — MR. H. S. CLOGG
Royal Free — MR. JAMES BELL
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Cancer — MR. C. RYALL
Hospital for Sick Children — MR. C. F. W. TOWN
West London — MR. T. H. CLARKE
National — MR. PERCY B.

St. Peter's — MR. J. THOMSON WALKER
Prince of Wales — MR. H. W. CARSON
Hamptstead — MR. J. JACKSON CLARKE
St. Marks — MR. F. LOCKHART MUMFERY
New Hospital for Women — MISS ALDRIDGE
BLAKE
Chelsea Hospital for Women — DR. T. W. EDEN
Royal London Ophthalmic — MR. A. C. HUDSON
Seamans — MR. C. C. CHAMBERS
Royal Ear — MR. J. F. O'MALLEY
Hospital of Diseases of the Throat — MR. G. W. BADGERON
Royal Westminster — MR. W. H. M. MULLER
Central London Throat and Ear Hospital — MR. DAN MCKENZIE
Samaritan Free Hospital for Women — DR. F. J. MCCANN

CLINICAL CONGRESS OF SURGEONS OF NORTH AMERICA

GEORGE EMERSON BREWER, President
W. W. CHITMAN, Vice President
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JOHN B. MURPHY, President Elect
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Honorary Chairman: SIR RICHMAN J. GOOLKE
Honorary Secretaries: MR. HERBERT J. PATERSON, MR. HERBERT S. PENDERBURY

THE CLINICAL CONGRESS

THE 1914 Congress will soon be in session. The last of July will find a notable gathering of surgeons and surgical specialists in London to witness the British surgeons as they exhibit their surgical skill in their accustomed environment and in their own institutions. The wonderful interest that has been engendered in these Congresses in Chicago, Philadelphia and New York on the part of American surgeons will be greatly heightened when they have the opportunity to stand shoulder to shoulder with their English and Continental confrères and observe the London clinical methods. In a few years this idea of holding a clinical meeting has revolutionized the conduct of medical societies in America, and it now remains to be demonstrated whether or not the same idea will meet with similar approval by the surgeons of England.

During the days of the Congress the clinics by eminent London surgeons will be observed by many visitors from America, Canada, the Continent, and the Provinces. At the evening sessions the scene will be changed, when the celebrated surgeons of the Continent, America, Canada and the Provinces will reciprocate by furnishing the scientific entertainment to the members of the Congress and to the London surgeons, delivering messages on the live surgical questions of the day.

A review of the Clinical Program, printed on the following pages, gives but a fair idea of the great interest that is being taken in this session

of the Congress by the London surgeons. The work of organization is progressing rapidly and by the time the Congress is opened a considerable portion of the clinical facilities of London will be available to the visiting surgeons.

The program for the Evening Sessions as pointed in this issue, gives only a tentative outline of the wealth of interesting material that will be presented by the visiting surgeons and briefly discussed by the London surgeons.

LONDON AS A POST-GRADUATE CENTER

London is a great post-graduate center in medical instruction and training, and no doubt many of the younger visiting surgeons upon discovering the advantages to be gained by attending the London clinics will take this occasion to make arrangements for more formal and prolonged courses either in the immediate future or later.

HEADQUARTERS OF THE CONGRESS

The headquarters of the Congress are ideal. The embankment suites of entertainment halls of the capacious Hotels Cecil and Savoy located side by side in the hospital center of London, have been secured for the registration rooms, exhibition halls, and evening meeting rooms. These great hosteries, with their combined capacity for more than fifteen hundred guests, are located within a stone's throw of many of the other famous hotels of London.



St. Thomas' Hospital — Albert Embankment, Westminster Bridge, S. E. The Hospital faces the Thames and Houses of Parliament. It is one of the largest London hospitals and contains 600 beds.

Surgeons on reaching London should proceed at once to the headquarters, register and receive their membership cards and tickets which will admit them to the evening meetings and to the clinics. The registration fee is five dollars, or twenty-one shillings.

Those who prefer to do so may register in advance and receive their credentials, by sending the amount of the fee to the General Secretary, Clinical Congress of Surgeons, 30 North Michigan Avenue Chicago, before July 31 after which time remittance should be sent to the London office of the Congress, No. 1 Wimpole St. London, W. England.

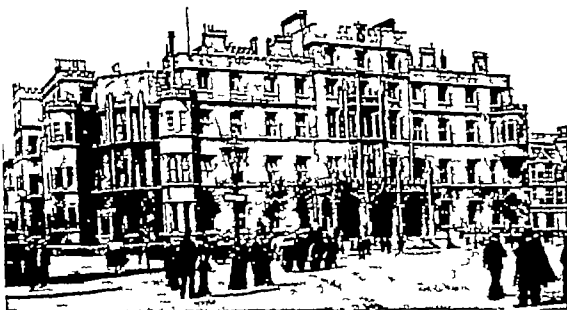
BULLETIN ROOMS

At the Hotel Cecil will be bulletined the clinics in General Surgery Gynecology and Obstetrics, Genito-Urinary Surgery Orthopedics X-ray and Laboratory Demonstrations at the Savoy the clinics and demonstrations in Surgery of the Eye, Ear, Nose and Throat. The program for Monday July 7th, will be bulletined on Saturday afternoon July 25th, two days before the opening of the Congress, and on the afternoon of each day of the session a complete, accurate program of the clinics and demonstrations to be given on the succeeding day will be posted on the bulletin board. The registration and bulletin



St. Bartholomew's Hospital — West Smithfield, E. C. Founded by Rahere in 1123. It is the oldest and second largest hospital in London. It contains 670 beds, in addition to 70 beds for convalescent patients, at Swanley in Kent. The picture on the left shows the new wing.





Westminster Hospital—Opposite Westminster Abbey, S. W. Was first founded in 1799, incorporated in 1836 and contains 35 beds.

rooms will also be open on Sunday, July 26th, for the accommodation of early arrivals.

MEMBERSHIP IN THE CONGRESS

Any physician or surgeon legally qualified to practice surgery in his community may become a member of the Clinical Congress by registering at any annual meeting and paying the registration fee.

Automatically the subscribers to **SURGERY GYNECOLOGY AND OBSTETRICS**, the official journal of the Congress, will receive invitations without request. Other members of the profession who desire to attend will receive formal invitations upon request to Franklin H. Martin, M. D., General Secretary, 30 North Michigan Avenue, Chicago, or to N. Wimpole St., London, W.



Middlesex Hospital—Barnes, M. W. Founded in 1745. Present capacity 265 beds.



University College Hospital—Gower St. W. C. Founded in 1833. Rebuilt and enlarged in 1897 and 1905.



Guy Hospital, London Bridge S. E. The Hospital as founded by Thomas Guy in 1729. It has 626 beds, and with its many buildings occupies six acres of ground.

REGISTRATION FEE. ADVANCE REGISTRATION.

A registration fee is required of each surgeon upon registration at which time a membership card will be issued as stated above. North American surgeons who wish credentials to enable them to secure reduced team ship rates may register in

advance and receive certificate of membership. The registration fee of five dollars should be sent to the General Secretary, 30 N. Michigan Avenue, Chicago, before July 1st or 1 N. Wimpole St. London W. after July 1st.



Royal London Ophthalmic Hospital—City Road, E. C.



Royal Free Hospital—Gray's Inn Road, W. C. Founded in 1828 by the late Dr. William Marsden. It contains 65 beds and treats about 39,000 patients annually.



London Hospital—Mifflin End, E. This Hospital established in 1740 is the largest hospital in London, having capacity of 922 beds.

Unlike conditions prevailing in most medical societies, where annual dues are paid by each member without regard to his attendance at any meeting of the society, the payment of a registration fee is required of a member of the Congress only when he is in attendance at an annual session.

The purpose of this fee is to provide funds to meet the expenses of preparing for and conducting the annual meeting, in order that no financial burden other than the registration fee may be imposed upon the members of the profession in the city entertaining the Congress. Judging from past experience, the amount received from



West London Hospital—Hammer-smith Road, W. Instituted in 1876.



Prince of Wales Hospital—Tottenham, N. The hospital as established in 1807.



St. George's Hospital—11 de Park, S. W. It founded in 714. It has 425 beds, 90 of which are allotted to surgical cases.

uch fees will be barely sufficient for the purpose so that payment of the fee is expected of all who attend the clinics or evening sessions.

RESERVED SEATS FOR CLINICS

Reserved tickets for all clinics and demonstrations, properly numbered and couponed, corresponding to the capacity of each operating room will be issued and booth will be established at headquarters where these tickets may be secured.

A tentative program will be furnished about July 1st to all prospective attendants of the Congress who apply for the same. The program will be printed in *SURGERY GYNECOLOGY AND OBSTETRICS*, the official journal of the Congress, and in other medical journals. From this program one may make his selection of the clinics he wishes to attend and send a written request for reserved tickets to Mr. A. D. Bassou, General Manager, No. 1 Wimpole St. London, W., stating definitely for just what clinics the ticket are desired. These tickets will be retained at headquarters up to a certain fixed time (to be determined and announced later) (the name of the applicant and will be assigned as nearly as possible in order of application. That the applicants may not be disappointed if the tickets for their first choice are exhausted, several selections should be made.

MEMBERSHIP CARDS

Each surgeon who desires to attend the clinics and evening sessions must register at headquarters and secure a membership card. Admission to all clinics and evening sessions will be limited strictly to members of the Congress upon presentation of such membership cards.

THE EVENING MEETINGS

Evening meetings will be held simultaneously in the halls the general surgical program to be given in the Grand Hall of the Hotel Cecil and the program of the specialties, Surgery of the Eye, Ear, Nose and Throat and Oral Surgery in the Ballroom of the Hotel Savoy.

The meetings will begin at 8.30 o'clock and adjourn not later than 11.45. The principal papers are to be read by visiting surgeons and a time limit of twenty-five minutes has been fixed for each address. The papers are to be discussed by London surgeons and the discussions limited to ten minutes each.

ENTERTAINMENTS

It has been the policy of the Clinical Congress of Surgeons to discourage large entertainments of a social nature. The time is so carefully arranged and occupied by scientific meetings and clinics that there is no proper time for social functions.

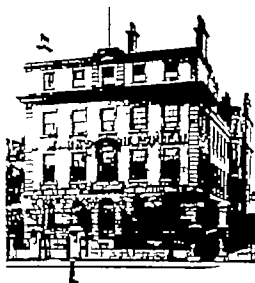


Hospital for Sick Children—Great Ormond St. W. C. Founded in 1853.

Then too, the Congress of necessity must always be held in large cities where there is much of general interest in the way of theaters, museums, and art galleries, which affords entertainment for those seeking occasional recreation and for the accompanying ladies. This plan has worked out so well in other cities where sessions of the Congress have been held that it is hoped the same policy will be observed in London. It must be remembered that the burden to the profession or a municipality of entertaining large medical societies in recent years has become so great as to be almost prohibitive.

SAILING ACCOMMODATIONS AVAILABLE

It is urged that accommodations for going and return passage be arranged for at the earliest possible date. The Transportation Manager of the Congress is in a position to obtain excellent accommodations on any of the leading steamship lines at rates that will suit the financial requirements of the inquirer. Reservations can be made



St. Mark Hospital — City Road, E. C. Founded in 855. For the treatment of cancer, fistula, etc.



St. Peter Hospital — Henrietta St. Covent Garden.

on some of the late sailing fast steamers, whereby a surgeon may attend the Congress and return with the loss of but three weeks' time. For the convenience of those who have not yet arranged their sailing dates a list of the steamers and their sailing dates going and returning is given on pages xlii and xliii of the advertising department of this journal.

Members of the Congress are advised to make their sailing reservations direct through Mr. J. P. McCann, as he is in position to make the best choice of accommodations on any of the lines and to give all information about the reduction in rates and on any other points. Address all communications on transportation to Mr. J. P. McCann, Transportation Manager, Marbridge Building, New York City.

SPECIAL RATES

A special reduction of 5 per cent to members of the Clinical Congress and their immediate families is being made by the International Mercantile Marine, which includes the White Star, Atlantic Transport, American Line, and Red Star Line, for passage to London after July 9th, with the exception of the S. S. Oceanic, July 4th, for which they will grant the reduction and on other lines after July 15th, with the exception of the Hamburg American Line, which will grant the reduction for the Kaiserin Augusta Victoria leaving on July 12th. The Cunard

PROGRAM OF EVENING SESSIONS

GENERAL SURGICAL DIVISION

Presidential Meeting Monday July 27th in the Grand Hall Hotel Cecil

Formal Opening.

Address of Welcome by **SIR RICHARD J. GOOLKE**, Honorary Chairman of the London Committee.Welcome to American Surgeons, by the **HONORABLE WALTER HUGH PAINE**, American Ambassador**GEORGE EMERSON BREWER**, M. D. New York City: Address of retiring president.Inauguration of **PRESIDENT JOHN B. MURPHY** and **VICE PRESIDENT GEORGE E. ARMSTRONG**.**PROFESSOR A. VON EISELSBERG**, Vienna: The Choice of the Operative Method for Ulcer of the Stomach.Discussion by **SIR W. THOM CREEVE** and **Mrs. JAMES STEVENSON**.**JOHN B. MURPHY**, M. D. Chicago, Presidential Address. Arthrodesis and Bone Transplantation; Its Limitations and Technique.*Tuesday July 28th in the Grand Hall Hotel Cecil***HENRY JELLINEK**, F. R. C. P. Dublin: The Use of the Levator-Ani Muscle and the Utero-Sacral Ligament in Prolapse Treatment.Discussion by **Dr. Herbert Spencer**, London.**E. WILLIS ANDREWS**, M. D. Chicago: Core of Nerve by Tissue Inlaying or Fascial Implantation.Discussion by **LAWRENCE HUGH MCG VON**, F. R. C. S.**ROBERT JONES**, F. R. C. S., Liverpool: Certain Displacements of the Knee Joint and Their Treatment.Discussion by **M. A. IL TUBBY** and **Mr. Robert Milne**.*Wednesday July 29th in the Grand Hall Hotel Cecil***GEORGE E. ARMSTRONG**, M. D. Montreal: Typhoid Perforation.Discussion by **SIR ANTHONY BOWLEY**, F. R. C. S., London.**CHARLES H. MAYO**, M. D. Rochester: Primary and Lat. Results of Operations for Exophthalmic Goiter or Hyperthyroidism.Discussion by **JAMES BELL**, F. R. C. S.*Thursday July 30th in the Grand Hall Hotel Cecil***PROFESSOR DOCTOR KROGG**, Freiburg, Germany: The Principles of Non-Operative Treatment of Carcinomas.**JAMES F. PERRY**, M. D. Galesburg, Illinois: The Treatment of Inoperable Carcinoma of the Uterus by the Application of Heat.**THOMAS WILSON**, F. R. C. S., Birmingham: Radical Operative Treatment of Cancer of the Uterus.Discussion by **THOMAS WATTS EDEN**, F. R. C. S., **W. E. MILLER**, F. R. C. S., London and **Dr. JOSEPH COLL BLOODGOOD**, Baltimore.*Friday July 31st, in the Grand Hall Hotel Cecil***PROFESSOR TUFTIER**, Paris: Transplantation of Ovaries.Discussion by **Sir John Bland-Sutton**.**SIR WILLIAM OCKER**, Bart., Oxford: Intestinal Stasis.Discussion by **SIR ARISTOTEL LARK**, Bart.**SIR RICHARD MORTIMER**, Leeds: Intestinal Stasis.**JOSEPH COLL BLOODGOOD**, M. D. Baltimore: Surgery of Intestinal Stasis.

PROGRAM OF EVENING SESSIONS—*Continued*

DIVISION OF SURGICAL SPECIALTIES

Tuesday July 28th in the Ballroom of the Hotel Savoy

PROFESSOR E. SCHMIDTKELOW Copenhagen, Denmark. The Results of Operations (Laryngofissure) for Intrinsic Cancer of the Larynx.

Discussion by Sir ST. CLAIR THOMSON London.

Dr. J. M. WERT Berlin, Germany. The Intranasal Surgery of the Lachrymal Apparatus, after an Experience with over 5 Operations.

Discussion by Dr. D. R. P. TEEBON of Cardiff.

Wednesday July 29th in the Ballroom of the Hotel Savoy

Dr. A. LOGAN TURNER Edinburgh. The Application of Sialography to the Mastoid Region and Its Use in the Detection of Disease.

Discussion by Mr. SURGEY SCOTT London.

Mr. HUGH E. JONES, Liverpool, England. Some Considerations which Determine the Extent of an Operation in Septic Invasion of the Lateral Sinus.

Discussion by Mr. HUNTER TODD, London.

Thursday July 30 in the Ballroom of Hotel Savoy

Symposium on Surgery of the Cleft Palate (Papers to be limited to fifteen minutes each.)

ROBERT W. MURRA F. R. C. S. Liverpool.

W. W. GOTCHER M. D. F. R. C. S. Bradford.

JOHN ULRIKSEN, Copenhagen, Denmark.

THOMAS W. BROWN M. D. Chicago.

GEORGE V. L. BROWN M. D. Milwaukee, Wisconsin.

JOSEPH R. EASTMAN M. D. Indianapolis, Indiana.

Dr. ERNST KATZBERG, Berlin.

Discussions limited to ten minutes each, by Sir William Arbuthnot Lane, London; Edmund Owen, M. B., F. R. C. S., London; James Berry, M. B., F. R. C. S. London; Professor Keith, London; T. Percy Legg, M. S., F. R. C. S., London; and Dr. Edward S. Judd, Rochester, Minnesota.

Friday July 31st in the Ballroom of the Hotel Savoy

R. H. ELLIOTT, Lt. Col., I. M. S., Madras, India. The Sclero-Corneal Trephining Operation for Glaucoma.

Discussion by Mr. THEODORE COLLIER.

Mr. P. RICHARDSON CROSS, Bristol. Operative Procedure for Strabismus.

Discussion by Mr. N. BRIDLOW HARMAN, London.

Dr. JOHN B. STONY Dublin. The Operation for Senile Cataract.

Discussion by Mr. HOLMES SMITH.



Harepatrad General Hospital—Haverstock Hill, N. W. Established in 1888

and Allan Lines are granting the same reduction on and after July 2d and returning until August 27th from Europe

In all cases the minimum first class rate must be adhered to. Under no circumstances can the



National Hospital for the Paralyzed and Epileptic—Queen's Square, Bloomsbury W. C. Established 1859. 200 beds.

fare be less than the minimum rate. Further information and full particulars of all sailings can be obtained from Mr. J. P. McCann, Transportation Manager, Marbridge Building, Broadway at 34th Street, New York.



Royal Ear Hospital, 42-43 Dean Street, Soho, W. Founded in 1846



Royal Westminster Ophthalmic Hospital, King William Street, Strand, W. C. Established in 1846



Charing Cross Hospital Chancery Street, Charing Cross, W. C. Established in 1822.

LONDON HOTELS

In addition to the Cecil and Savoy the Headquarters of the Congress there are a large number of hotels centrally located which have agreed to make advance reservations for members of the Congress. These hotels include among others the Carlton, Metropole Grand, Victoria, Grosvenor Imperial, Russell Waldorf Ritz, Piccadilly Great Central, First Avenue Richmond, St. Ermins, Hans Crescent, Windsor Langham, Royal Palace and, de Keyers Royal

While there will be no difficulty in securing hotel accommodations somewhere in London during the week of the Congress, it is advisable to make reservations early.

SURGEONS INTERNATIONAL GOLF MATCH

NOTICE.—It is proposed to arrange a golf match between teams representing London surgeons and North American surgeons, on one afternoon during the week of the Congress. Arrangements will be made for the matches to take place at seven or eight of the numerous courses around London. In this way it will be possible to arrange for 50 or 100 couples to take part without crowding, as the number of couples playing on the same course will be limited to ten or twelve.

Members of the Congress who desire to play are requested to send their names and handicap to Mr. Herbert Paterson, at the London Office of the Congress, Wimpole St. W.

PROGRAM OF EVENING SESSIONS

GENERAL SURGICAL DIVISION

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Formal Opening.

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 Welcome to American Surgeons, by the HONORABLE WALTER HINES PAGE, American Ambassador.
 GEORGE EMERSON BARBER, M. D. New York City: Address of retiring president.

Inauguration of President JOHN B. MURPHY and Vice-President GEORGE E. ARMITAGE.

PROFESSOR A. VON EISELSBERG, Vienna: The Choice of the Operative Method for Ulcer of the Stomach.

Discussion by Sir WATSON CHESTNUT and Mr. JAMES SACCHARIS.

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Discussion by Dr. Herbert Spencer, London.

E. WYLLIE ANDREWS, M.D., Chicago: Cure of Hemola by Tissue Inlaying or Facial Implantation.

Discussion by LAWRENCE HUGH M. G. VAN F. R. C. S.

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Discussion by Mr. A. H. Tubby and Mr. Robert Miles.

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Discussion by JAMES BERRY, F. R. C. S.

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Discussion by THOMAS WATTS EYRE, F. R. C. S., W. E. MILNE, F. R. C. S., London; and Dr. JOSEPH COLE BLOODGOOD, Baltimore.

Friday July 31st in the Grand Hall Hotel Cecil

PROFESSOR TUFFIER, Paris: Transplantation of Ovaries.

Discussion by Sir JOHN BLAND-SUTTON.

SIR WILLIAM OWLER, Bart., Oxford: Intestinal Stenosis.

Discussion by Sir ARTHUR POT LANK, Bart.

SIR BENJAMIN MOTTIN, M. D., Leeds: Intestinal Stenosis.

JOSEPH COLE BLOODGOOD, M. D. Baltimore: Surgery of Intestinal Stenosis.

PROGRAM OF EVENING SESSIONS—*Continued*

DIVISION OF SURGICAL SPECIALTIES

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GEORGE V. L. BROWN M. D. Milwaukee Wisconsin.

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Discussion by Mr. THELACHER COLLIER.

Mrs. F. RICHARDSON CROSS, Bristol Operative Procedure for Strabismus.

Discussion by Mr. N. BISHOP HARRMAN London.

DR. JOHN B. STONE, Dublin The Operation for Senile Cataract.

Discussion by Mr. HOLMES SPICKER.

PRELIMINARY CLINICAL PROGRAM

SURGICAL CLINICS

Monday July 27th

MR. DARCY POWER—St. Bartholomew's Hospital—1 to 2.
 MR. H. J. WARING—St. Bartholomew's Hospital—1 to 2.
 MR. C. GORDON WATSON—St. Bartholomew's Hospital—1 to 2.
 MR. HAROLD W. WILSON—St. Bartholomew's Hospital—1 to 2.
 MR. H. B. ROBINSON—St. Thomas' Hospital—1 to 2.
 MR. CUTHBERT WALLACE—St. Thomas' Hospital—1 to 2.
 MR. J. E. ADAMS—St. Thomas' Hospital—1 to 2.
 MR. E. ROCK CARLING—Westminster Hospital—1 to 2.
 MR. ARBUTHNOT LANE—Guy's Hospital—1 to 2.
 MR. L. A. DUNN—Guy's Hospital—1 to 2.
 MR. F. J. STEWARD—Guy's Hospital—1 to 2.
 MR. C. H. FAGGE—Guy's Hospital—1 to 2.
 MR. R. F. ROWLANDS—Guy's Hospital—1 to 2.
 MR. P. TURNER—Guy's Hospital—1 to 2.
 MR. E. C. HUGHES—Guy's Hospital—1 to 2.
 MR. R. DAVIES-COLLEY—Guy's Hospital—1 to 2.
 MR. H. S. PINDLEBURY—St. George's Hospital—1 to 2.
 MR. T. CRISP ENGLISH—St. George's Hospital—1 to 2.
 MR. FREDERIC EVE—London Hospital—1 to 2.
 MR. HUGH LETT—London Hospital—1 to 2.
 MR. A. PEARCE GOULD and MR. W. S. HANDLEY—Middlesex Hospital—1 to 2.
 MR. A. E. BARKER—University College Hospital—1 to 2.
 MR. MILTON POLLARD—University College Hospital—1 to 2.
 MR. V. K. COPE—St. Mary's Hospital—1 to 2.
 MR. WATSON CHEYNE—King's College Hospital—1 to 2.
 MR. A. CARLESS—King's College Hospital—1 to 2.
 MR. T. F. LEGG—King's College Hospital—1 to 2.
 MR. A. EDMUNDS—King's College Hospital—1 to 2.
 MR. H. F. WATERHOUSE—Charing Cross Hospital—1 to 2.
 MR. JAMES BERRY—Royal Free Hospital—1 to 2.
 MR. W. ASHDOWNE—Metropolitan Hospital—1 to 2.
 MR. J. CUNNING and MR. CECIL ROWNTREE—Cancer Hospital—1 to 2.
 MR. E. M. CORNER—Hospital for Sick Children—1 to 2.
 MR. TYRRELL GRAY—Hospital for Sick Children—1 to 2.
 MR. D. ARMOUR—West London Hospital—1 to 2.
 MR. F. OLLESTED—Prince of Wales General Hospital—1 to 2.
 MR. LOCKHART MUMMERY—St. Mark's Hospital—1 to 2.
 MISS CHADBURN—New Hospital for Women—1 to 2.

Tuesday July 28th

MR. W. MOHAMMAD ECCLES—St. Bartholomew's Hospital—1 to 2.

MR. R. COZENS BAILEY—St. Bartholomew's Hospital—1 to 2.
 MR. G. H. MAKINS—St. Thomas' Hospital—1 to 2.
 MR. W. H. BATTLE—St. Thomas' Hospital—1 to 2.
 MR. C. A. BALLANCE—St. Thomas' Hospital—1 to 2.
 MR. H. B. ROBINSON—St. Thomas' Hospital—1 to 2.
 MR. CYRIL NITCH—St. Thomas' Hospital—1 to 2.
 MR. W. O. SPENCER—Westminster Hospital—1 to 2.
 MR. ARBUTHNOT LANE—Guy's Hospital—1 to 2.
 MR. L. A. DUNN—Guy's Hospital—1 to 2.
 MR. F. J. STEWARD—Guy's Hospital—1 to 2.
 MR. C. H. FAGGE—Guy's Hospital—1 to 2.
 MR. R. F. ROWLANDS—Guy's Hospital—1 to 2.
 MR. P. TURNER—Guy's Hospital—1 to 2.
 MR. E. C. HUGHES—Guy's Hospital—1 to 2.
 MR. G. R. TURNER—St. George's Hospital—1 to 2.
 MR. F. JAFFREY—St. George's Hospital—1 to 2.
 MR. H. M. RIGBY—London Hospital—1 to 2.
 MR. JAMES SHUREN—London Hospital—1 to 2.
 MR. R. WARREN—London Hospital—1 to 2.
 MR. F. KIDD—London Hospital—1 to 2.
 MR. JOHN MURRAY and MR. ALFRED JOHNSON—Middlesex Hospital—1 to 2.
 MR. T. H. KELLOCK and MR. GORDON TAYLOR—Middlesex Hospital—1 to 2.
 MR. RAYMOND JOHNSON—University College Hospital—1 to 2.
 MR. WILFRED TROTTER—University College Hospital—1 to 2.
 MR. WARREN LOW—St. Mary's Hospital—1 to 2.
 MR. F. F. BURGHARD—King's College Hospital—1 to 2.
 MR. G. L. CHEATLE—King's College Hospital—1 to 2.
 MR. STANLEY BOYD—Charing Cross Hospital—1 to 2.
 MR. W. H. EVANS—Royal Free Hospital—1 to 2.
 MR. H. CURTIS—Metropolitan Hospital—1 to 2.
 MR. JOCELYN SWAN and MR. H. W. WILSON—Cancer Hospital—1 to 2.
 MR. ARBUTHNOT LANE—Hospital for Sick Children—1 to 2.
 MR. GEORGE WAUGH—Hospital for Sick Children—1 to 2.
 MR. A. BALDWIN—West London Hospital—1 to 2.
 MR. G. L. ADDISON—West London Hospital—1 to 2.
 MR. VICTOR HORSLEY—National Hospital—1 to 2.
 MR. H. W. CARSON—Prince of Wales General Hospital—1 to 2.
 MISS ALDRICH BLAKE—New Hospital for Women—1 to 2.

Wednesday July 29th

SIR ANTHONY BOWLEY—St. Bartholomew's Hospital—1 to 2.
 MR. H. J. WARING—St. Bartholomew's Hospital—1 to 2.
 MR. W. GIRLING BALL—St. Bartholomew's Hospital—1 to 2.

MR. G. H. MAKINS — St. Thomas' Hospital — to 5.
 MR. W. H. BATTLE — St. Thomas' Hospital — to 5.
 MR. C. A. BALLANCE — St. Thomas' Hospital — to 5.
 MR. H. B. ROBINSON — St. Thomas' Hospital — to 5.

MR. E. M. CORNER — St. Thomas' Hospital — to 5.
 MR. PERCY BARGENT — St. Thomas' Hospital — to 5.

MR. C. STONHAM — Westminster Hospital —
 MR. J. M. G. SWAINSON — Westminster Hospital — to 5.
 MR. IVOR BACK — St. George's Hospital — to 5.
 MR. C. H. FRANKAU — St. George's Hospital — to 5.

MR. J. HUTCHINSON — London Hospital — 2.
 MR. R. MILNE — London Hospital —

MR. A. J. WALTON — London Hospital — 9.
 SIR JOHN BLAND-SUTTON and MR. GORDON TAYLOR — Middlesex Hospital — 30.

MR. RAYMOND JOHNSON — University College Hospital — 2.
 MR. MAYNARD SMITH — St. Mary's — 9.

SIR WATSON CHEYNE — King's College Hospital — 9.
 MR. A. CARLESS — King's College Hospital —

MR. T. P. LEGG — King's College Hospital —
 MR. CHARLES GIBBS — Charing Cross Hospital — to 5.

MR. JAMES BERRY — Royal Free Hospital — to 5.
 MR. J. CUNNING — Royal Free Hospital — to 5.
 MR. P. L. DANIEL — Metropolitan Hospital —

MR. C. RYALL — Cancer Hospital —
 MR. T. H. KELLOCK — Hospital for Sick Children — to 5.

MR. L. E. BARRINGTON-WARD — Hospital for Sick Children — to 5.
 MR. J. HOWELL EVANS — Prince of Wales General Hospital — to 5.

MR. JACKSON CLARKE — Hampstead General Hospital — 9.
 MR. GEORGE WAUGH — Hampstead General Hospital —

MR. SIDNEY BOYD — Hampstead General Hospital — 9.
 MR. CHAD WOODWARD — Hampstead General Hospital — 9.

MR. ASLETT BALDWIN — St. Mark Hospital — 30.
 MISS GARRETT ANDERSON and MISS BOLTON — New Hospital for Women — 9.

Thursday July 30th

MR. DARCY POWER — St. Bartholomew's Hospital — 30.
 MR. R. COZEN'S BAILEY — St. Bartholomew's Hospital — 30.

MR. L. BATHE RAWLING — St. Bartholomew's Hospital — 30.
 MR. G. E. GASK — St. Bartholomew's Hospital — to 30.

MR. H. B. ROBINSON — St. Thomas' Hospital — to 5.
 MR. CUTHBERT WALLACE — St. Thomas' Hospital — to 5.

MR. E. M. CORNER — St. Thomas' Hospital — to 5.
 MR. J. E. ADAMS — St. Thomas' Hospital — to 5.
 MR. W. TURNER — Westminster Hospital — 9.

SIR ARBUTHNOT LANE — Guy's Hospital — 2.
 MR. F. J. STEWARD — Guy's Hospital —
 MR. C. H. FAGGE — Guy's Hospital —

MR. P. TURNER — Guy's Hospital — 2.
 MR. E. C. HUGHES — Guy's Hospital —
 MR. R. DAVIES-COLLEY — Guy's Hospital — 2.
 MR. G. R. TURNER — St. George's Hospital — 30.

MR. T. CRISP ENGLISH — St. George's Hospital — 30 to 4.
 MR. W. FEDDE FEDDEN — St. George's Hospital — to 5.

MR. IVOR BACK — St. George's Hospital — to 5.
 MR. C. H. FRANKAU — St. George's Hospital — to 5.

MR. T. H. OPENSHAW — London Hospital — 2.
 MR. RUSSELL HOWARD — London Hospital — 9.

MR. F. KIDD — London Hospital — 2.
 SIR A. PEARCE GOULD and MR. W. B. HANDLEY — Middlesex Hospital — 30.

MR. A. E. BARKER — University College Hospital — 2.
 MR. MORRISTON DAVIES — University College Hospital — 9.

MR. W. H. CLAYTON-GREEN — St. Mary's Hospital — 9 and
 MR. F. F. BURGHARD — King's College Hospital —

MR. A. EDMUNDS — King's College Hospital — 2.
 MR. H. F. WATERHOUSE — Charing Cross Hospital — to 5.

MR. W. S. FENWICK — Charing Cross Hospital — 9 to 2.
 MR. C. PANNETT — Royal Free Hospital — to 5.

MR. W. E. MILES — Cancer Hospital —
 MR. H. A. T. FAIRBANK — Hospital for Sick Children — to 5.

MR. O. L. ADDISON — Hospital for Sick Children — 9 to 2.
 MR. H. W. CARSON — Prince of Wales General Hospital — to 30.

MR. GORDON WATSON — St. Mark's Hospital — 30.
 MISS CHADBURN — New Hospital for Women —

Friday July 31st

SIR ANTHONY BOWLBY — St. Bartholomew's Hospital — 30.
 MR. W. MCADAM ECCLES — St. Bartholomew's Hospital — 30.

MR. G. H. MAKINS — St. Thomas' Hospital — to 5.
 MR. W. H. BATTLE — St. Thomas' Hospital — to 5.
 MR. C. A. BALLANCE — St. Thomas' Hospital — to 5.

MR. CYRIL NITCH — St. Thomas' Hospital — to 5.
 MR. ARTHUR EVANS — Westminster Hospital — 9.

SIR ARBUTHNOT LANE — Guy's Hospital —
 MR. L. A. DUNK — Guy's Hospital — 2.
 MR. F. J. STEWARD — Guy's Hospital — 2.

MR. C. H. FAGGE — Guy's Hospital —
 MR. R. P. ROWLANDS — Guy's Hospital —
 MR. P. TURNER — Guy's Hospital — 2.

MR. E. C. HUGHES — Guy's Hospital —
 MR. F. JAFFREY — St. George's Hospital — 30 to 4.
 MR. H. S. FENDLEBURY — St. George's Hospital — 30 to 4.

SIR FREDERIC EVE — London Hospital —
 MR. H. M. RIGBY — London Hospital — 9.
 MR. JAMES SHERRIN — London Hospital — 2.

MR. HUGH LETT — London Hospital — 2.
 MR. JOHN MURRAY and MR. ALFRED JOHNSON — Middlesex Hospital — 30.

MR. T. H. KELLOCK and MR. GORDON TAYLOR — Middlesex Hospital — 30.

MR. BILTON POLLARD—University College Hospital—2.
 MR. WILFRED TROTTER—University College Hospital—2.
 MR. D. C. L. FITZWILLIAMS—St. Mary's Hospital—9.
 SIR WATSON CHEYNE—King's College Hospital—2.
 MR. A. CARLESS—King's College Hospital—9.30.
 MR. G. L. CHEATLE—King's College Hospital—2.
 MR. T. P. LEGGE—King's College Hospital—9.30.
 MR. A. EDMUNDS—King's College Hospital—2.
 MR. STANLEY BOYD—Charing Cross Hospital—to 5.
 MR. P. L. DANIELS—Charing Cross Hospital—9 to 12.
 MR. W. H. EVANS—Royal Free Hospital—to 5.
 MR. H. CURTIS—Metropolitan Hospital—2.
 SIR ARBUTHNOT LANE—Hospital for Sick Children—9 to 12.
 MR. O. L. ADDISON—Hospital for Sick Children—to 5.
 MR. H. S. SOUTAR—West London Hospital—9.
 MR. J. HOWELL EVANS—Princes of Wales General Hospital—1.30 to 4.30.
 MR. J. W. THOMSON WALKER—Hampstead General Hospital—2.
 MR. GEORGE WAUGH—Hampstead General Hospital—2.
 MR. SIDNEY BOYD—Hampstead General Hospital—to 12.
 MR. CHAD WOODWARD—Hampstead General Hospital—2.
 MISS ALDRICH BLAKE—New Hospital for Women—9.

MR. DONALD ARMOUR—National Hospital—Surgery of the Head and Nervous system.
 MR. PEKCY SARGENT—National Hospital—Surgery of the Head and Nervous system.

Saturday August 1st

MR. W. FEDDE FLEDDEN—St. George's Hospital—3.30 to 4.
 MR. IVOR BACK—St. George's Hospital—to 4.
 SIR JOHN BLAND-SUTTON and MR. GORDO TAYLOR—Middlesex Hospital—3.30.
 MR. MORRISTON DAVIES—University College Hospital—9.
 MR. F. T. BURGHARD—King's College Hospital—9.30.
 MR. G. L. CHEATLE—King's College Hospital—2.
 MR. CHARLES GIBBS—Charing Cross Hospital—9 to 12.
 MR. H. S. CLOGG—Charing Cross Hospital—to 12.
 MR. C. A. JOLL—Royal Free Hospital—to 5.
 MR. P. L. DANIEL—Metropolitan Hospital—2.
 MR. H. A. T. FAIRBANK—Hospital for Sick Children—9 to 12.
 MR. H. TYRRELL GRAY—West London Hospital—9.
 MR. K. GILLESPIE—Princes of Wales General Hospital—9.30 to 12.30.

Days and Hours to be Announced

MR. MAYNARD SMITH—St. Mary's Hospital.

GYNECOLOGICAL CLINICS

Monday July 27th

DR. W. S. A. GRIFFITH—St. Bartholomew's Hospital—2.
 DR. A. F. STABB and DR. G. F. DARWELL SMITH—St. George's Hospital—9.15 to 1.
 DR. DRUMMOND MAXWELL—London Hospital—2.
 DR. JOHN PHILLIPS—King's College Hospital—2.
 DR. A. E. GILES—Chelsea Hospital for Women—9.30.
 DR. A. DODD—Chelsea Hospital for Women—9.30.
 DR. C. H. ROBERTS—Samaritan Free Hospital for Women—2.
 DR. J. A. WILLETT—Samaritan Free Hospital for Women—9.
 DR. DARWELL SMITH—Samaritan Free Hospital for Women—9.

Tuesday July 28th

DR. J. BARRIS—St. Bartholomew's Hospital—3.30.
 DR. WALTER TATE—St. Thomas' Hospital—to 5.
 MR. H. CHAPPLE—Guy's Hospital—9.
 DR. COMYNS BERKELEY and DR. VICTOR BONNEY—Middlesex Hospital—3.30.
 DR. HERBERT SPENCER—University College Hospital—9.

DR. T. G. STEVENS—St. Mary's—9. (Obstet. Surgery.)
 DR. HUGH PLAYFAIR—King's College Hospital—2.
 DR. T. W. EDEN and DR. C. H. LOCKYER—Charing Cross Hospital—to 5.
 MRS. VAUGHAN SAWYER—Royal Free Hospital—to 6.
 DR. W. H. FENTON—Chelsea Hospital for Women—9.30.
 DR. VICTOR BONNEY—Chelsea Hospital for Women—9.30.
 DR. J. B. BANISTER—Chelsea Hospital for Women—9.30.
 DR. DRUMMOND ROBINSON—West London Hospital—2.
 MR. J. D. MALCOLM—Samaritan Free Hospital for Women—9.
 DR. F. J. MCCANN—Samaritan Free Hospital for Women—9.

Wednesday July 29th

DR. W. S. A. GRIFFITH—St. Bartholomew's Hospital—2.
 MR. G. B. SMITH—Guy's Hospital—9.

DR. F. J. McCANN—Samaritan Free Hospital for Women—2.
DR. C. LOCKYER—Samaritan Free Hospital for Women—9.

Thursday July 30th

DR. M. WILLIAMSON—St. Bartholomew's Hospital—9.30.
DR. WALTER TATE—St. Thomas Hospital—9.15.
DR. H. CHAPPEL—Guy's Hospital—9.
DR. DRUMMOND MAXWELL—London Hospital—9.30.
DR. COMYNS BERKELEY and DR. VICTOR BONE—Middlesex Hospital—30.
DR. GEORGE BLACKER—University College Hospital—2.
DR. JOHN PHILLIPS—King's College Hospital—
DR. H. G. PLAYFAIR and DR. EARDLEY HOLLAND—Metropolitan Hospital—
DR. T. W. EDEN—Chelsea Hospital for Women—9.30.
DR. F. L. PRORIS—Chelsea Hospital for Women—9.30.
DR. ARTHUR GILES and DR. J. B. BANISTER—Prince of Wales General Hospital—30 to 4.30.
DR. C. H. ROBERTS—Samaritan Free Hospital for Women—9.
DR. F. J. McCANN—Samaritan Free Hospital for Women—2.
DR. CLIFFORD WHITE—Samaritan Free Hospital for Women—9.

Friday July 31st

DR. W. S. A. GRIFFITH—St. Bartholomew's Hospital—2.

DR. G. H. D. ROBINSON and DR. S. DODD—Westminster Hospital—2.
MR. G. B. SMITH—Guy's Hospital—9.
DR. A. F. STABB and DR. G. F. DARWELL SMITH—St. George's Hospital—9.15.
DR. HUGH PLAYFAIR—King's College Hospital—
DR. T. W. EDEN and DR. C. H. LOCKYER—Chelsea Hospital—5.
MRS. WILLEY—Royal Free Hospital—9 to 2.
DR. COMYNS BERKELEY—Chelsea Hospital for Women—9.30.
DR. H. J. F. SIMON—West London Hospital—
DR. ARTHUR GILES and DR. J. B. BANISTER—Prince of Wales General Hospital—9.30 to 3.30.
MR. J. D. MALCOLM—Samaritan Free Hospital for Women—
DR. C. LOCKYER—Samaritan Free Hospital for Women—9.
DR. D. W. ROY—Samaritan Free Hospital for Women—
DR. W. GILLIATT—Samaritan Free Hospital for Women—9.

Saturday August 1st

DR. HERBERT SPENCER—University College Hospital—9.

Days and Hours to be Announced

DR. JOHN FAIRBAIRN and DR. J. P. HEDLEY—St. Thomas Hospital.
DR. W. J. GOW—St. Mary's Hospital.

GENTTO-URINARY SURGICAL CLINICS

Monday July 27th

DR. A. R. THOMSON—Guy's Hospital—9.

Wednesday July 29th

DR. J. S. PARDOE—West London Hospital—
DR. P. J. FREYER—St. Peter's Hospital—2.

MR. J. W. THOMSON WALKER—St. Peter's Hospital—

Friday July 31st

MR. F. SWINFORD EDWARDS—St. Peter's Hospital—
MR. G. S. PARDOE—St. Peter's Hospital—
MR. J. SWIFT JOLY—St. Peter's Hospital—2.

ORTHOPEDIC CLINICS

Monday July 27th

MR. R. C. ELSLIE — St. Bartholomew's Hospital —
 3³⁰.
 MR. A. H. TUBBY — Westminster Hospital — 2.

Tuesday July 28th

MR. R. C. ELSLIE — St. Bartholomew's Hospital —
 1³⁰.

MR. W. H. TRETHOWAN — Guy Hospital — 2.

Thursday July 30th

MR. H. A. T. FAIRBANK — Charing Cross Hospital
 9 to 2.

Friday July 31st

MR. W. H. TRETHOWAN — Guy's Hospital — 2.

OPHTHALMOLOGICAL CLINICS

Monday July 27th

MR. H. L. EASON — Guy's Hospital —
 MR. L. V. CARGILL — King's College Hospital —
 MR. H. W. LYLE — King's College Hospital
 MR. A. E. DORRELL — Prince of Wales General Hos-
 pital — 9³⁰ to 1³⁰.
 MR. TREACHER COLLINS — Royal London Ophthal-
 mic Hospital — 10.
 Mr. C. A. WORTH — Royal London Ophthalmic Hos-
 pital — 2.
 MR. M. L. HEPBURN — Royal London Ophthalmic
 Hospital — 10.
 MR. A. C. HUDSON — Royal London Ophthalmic Hos-
 pital — 10.

Tuesday July 28th

MR. W. H. JESSOP — St. Bartholomew's Hospital — 3
 MR. G. HARTRIDGE and MR. G. T. B. JAMES —
 Westminster Hospital — 9.
 MR. A. W. ORMOND — Guy's Hospital — 2.
 MR. M. L. HEPBURN — Royal Free Hospital — 9 to
 12.
 MR. E. T. COLLINS — Charing Cross Hospital — 9
 to 12.
 MR. HOLMES SPICER — Royal London Ophthalmic
 Hospital — 2.
 MR. PERCY FLEMING — Royal London Ophthal-
 mic Hospital — 2.
 MR. J. H. FISHER — Royal London Ophthalmic Hos-
 pital — 2.
 MR. C. D. MARSHALL — Royal London Ophthalmic
 Hospital — 2.

Wednesday July 29th

MR. H. BARR GRIMSDALE and MR. G. T. BROOKS-
 BANK JAMES — St. George's Hospital — 3³⁰ to 4.
 MR. W. T. LISTER — London Hospital — 2.
 MR. PERCY FLEMING — University College Hos-
 pital — 9.
 MR. E. T. COLLINS — Charing Cross Hospital — 9
 to 2.
 MR. R. P. BROOKS — Prince of Wales General Hos-
 pital — 3³⁰ to 4³⁰.

MR. J. B. LAWFOORD — Royal London Ophthal-
 mic Hospital — 2.
 MR. ARNOLD LAWSON — Royal London Ophthal-
 mic Hospital — 2.
 MR. J. H. PARSONS — Royal London Ophthalmic Hos-
 pital — 2.
 MR. GEORGE COATS — Royal London Ophthalmic
 Hospital — 2.

Thursday July 30th

MR. W. HOLMES SPICER — St. Bartholomew's Hos-
 pital — 2.
 MR. H. L. EASON — Guy's Hospital — 2.
 MR. A. B. ROXBURGH — London Hospital — 2.
 MR. L. V. CARGILL — King's College Hospital —
 DR. H. W. LYLE — King's College Hospital
 MR. H. PERCY DUNN — West London Hos-
 pital — 2.
 MR. TREACHER COLLINS — Royal London Ophthal-
 mic Hospital —
 MR. C. A. WORTH — Royal London Ophthalmic Hos-
 pital — 10.
 MR. M. L. HEPBURN — Royal London Ophthalmic
 Hospital —
 MR. A. C. HUDSON — Royal London Ophthalmic Hos-
 pital — 10.

Friday July 31st

MR. A. W. ORMOND — Guy Hospital —
 MR. HOLMES SPICER — Royal London Ophthalmic
 Hospital —
 MR. PERCY FLEMING — Royal London Ophthal-
 mic Hospital —
 MR. J. H. FISHER — Royal London Ophthalmic Hos-
 pital —
 MR. C. D. MARSHALL — Royal London Ophthalmic
 Hospital —

Saturday August 1st

MR. H. BARR GRIMSDALE and MR. G. T. BROOKS-
 BANK JAMES — St. George's Hospital — 9³⁰
 to 1.

MR. HERBERT PARSONS — University College Hospital — 9
 MR. J. B. LAWFOED — Royal Ophthalmic Hospital — 10
 MR. ARNOLD LAWSON — Royal London Ophthalmic Hospital — 10
 MR. J. H. PARSONS — Royal London Ophthalmic Hospital — 10

MR. GEORGE COATS — Royal London Ophthalmic Hospital — 10

Days and Hours to be Announced

MR. J. B. LAWFOED and MR. J. H. FISHER — St. Thomas' Hospital.
 MR. ARNOLD LAWSON — Middlesex Hospital.
 MR. L. J. PATON — St. Mary Hospital.

OTOLOGICAL LARYNGOLOGICAL AND RHINOLOGICAL CLINICS

Monday July 27th

MR. W. D. HARMER — St. Bartholomew's Hospital — 330
 MR. C. E. WEST — St. Bartholomew's Hospital — 330
 MR. W. O. HOWARTH — St. Thomas' Hospital — 9
 MR. HERBERT TILLY — University College Hospital — 1

MR. WILLIAM HILL — St. Mary's — 9
 MR. ARTHUR CHEATLE — King's College Hospital — 2
 MR. WILLIAM HILL — St. Mary's Hospital — 2
 MR. GAY FRENCH — Royal Free Hospital — 9 1
 MR. R. S. COCKE — Royal Ear Hospital — 2

Tuesday July 28th

MR. J. A. ROSE — St. Bartholomew's Hospital — 45
 MR. W. M. MOLLISON — Guy's Hospital — 9
 MR. H. S. BARWELL — St. George's — 9 5 1
 SIR ST. CLAIR THOMSON — King's College Hospital — 1
 MR. E. B. WAGGETT and MR. E. D. DAVIS — Charing Cross Hospital — 9 1 2
 MR. H. D. GILLIES — Prince of Wales General Hospital — 9 30 to 30
 MR. JEFFERSON FAULDER — Hospital for Diseases of the Throat — 30
 MR. R. S. COCKE — Royal Ear Hospital — 30
 MR. H. A. KISCH — Royal Ear Hospital — 30

Wednesday July 29th

MR. W. D. HARMER — St. Bartholomew's Hospital — 45
 MR. C. E. WEST — St. Bartholomew's Hospital — 9
 MR. H. J. MARRIAGE — St. Thomas' Hospital — 9 to 2
 MR. T. B. LAYTON — Guy's Hospital — 9
 MR. J. A. EDMOND — Guy's Hospital — 9
 MR. H. S. BARWELL — St. George's Hospital — 35
 MR. SOMERVILLE HASTINGS — Middlesex Hospital — 30
 MR. STICCOMBE HETT — University College Hospital — 2

MR. ARTHUR CHEATLE — King's College Hospital — 1

MR. C. V. HOPE — King's College Hospital — 2
 MR. H. J. DAVIS — West London Hospital — 10
 MR. GEORGE BADGEROW — Hospital for Diseases of the Throat — 9
 MR. P. M. YEARSLEY — Royal Ear Hospital — 1

Thursday July 30th

MR. SYDNEY SCOTT — St. Bartholomew's Hospital — 9
 MR. W. G. HOWARTH — St. Thomas' Hospital — 9 to 9
 MR. H. J. MARRIAGE — St. Thomas' Hospital — to 5
 MR. P. M. de SANTI — Westminster Hospital — 2
 MR. HUNTER TOD — London Hospital — 30
 MR. SOMERVILLE HASTINGS — Middlesex Hospital — 9
 MR. C. J. GRAHAM — St. Mary's — 9
 SIR ST. CLAIR THOMSON — King's College Hospital — 1
 MR. ARTHUR CHEATLE — King's College Hospital — 2
 MR. GEORGE WAUGH — Hospital for Sick Children — 3 to 5
 MR. CHARLES PARKER — Hospital for Diseases of the Throat — 30
 MR. FITZGERALD POWELL — Hospital for Diseases of the Throat — 30
 MR. RICHARD LAKE — Royal Ear Hospital — 1

Friday July 31st

MR. W. D. HARMER — St. Bartholomew's Hospital — 5
 MR. W. M. MOLLISON — Guy's Hospital — 9
 MR. HERBERT TILLY — University College Hospital — 2
 SIR ST. CLAIR THOMSON — King's College Hospital — 1
 MR. E. B. WAGGETT and MR. E. D. DAVIS — Charing Cross Hospital — 9 to 9
 MR. J. W. BOND — Hospital for Diseases of the Throat — 3
 MR. FRANK ROSE — Hospital for Diseases of Throat — 2
 MR. P. M. YEARSLEY — Royal Ear Hospital — 2
 DR. E. A. PETERS — Royal Ear Hospital — 2

SPECIAL DEMONSTRATIONS

Monday July 27th

- DR. A. D. REID, DR. W. R. BRISTOW and DR. CLAUDE GOULDESBOUGH—St. Thomas' Hospital—9 to 12. X-ray and Electro-Therapeutics.
 DR. W. S. FOX and DR. G. A. SIMMONS—St. George's Hospital—10 to 4. X-ray and Electro-Therapeutics Department.
 MR. W. E. MILES—Cancer Hospital—4.30. Cancer of the Rectum.
 DR. R. HUTCHINSON—Hospital for Sick Children—9 to 12. Infantile Scoury.
 MR. H. A. T. FAIRBANK—Hospital for Sick Children—4 to 5. Subluxation of the Shoulder Joint in Infants.

Tuesday July 28th

- DR. A. D. REID, DR. W. R. BRISTOW and DR. CLAUDE GOULDESBOUGH—St. Thomas' Hospital—9 to 12. X-ray and Electro-Therapeutics.
 MR. R. T. TIMBERG—St. Thomas' Hospital—9 to 12. Physical Exercises.
 DR. ROBERT KNOX—King's College Hospital—9 to 12. Radiography.
 DR. W. D'ESTS EMERY—King's College Hospital—9 to 12. Pathological Laboratory.
 MR. W. H. EVANS—Royal Free Hospital—9 to 12. Surgical Cases.
 MR. C. RYALL—Cancer Hospital—4.30. Cancer of the Tongue and Mouth.
 DR. A. F. VOELCKER—Hospital for Sick Children—10 to 12. Abdominal Tuberculosis.
 SIR VICTOR HORSLEY—National Hospital. Some Practical Points in Craniotomy.
 MR. L. E. BARRINGTON WARD—Hospital for Sick Children—4 to 5. Cases of Hirschsprung's Disease Treated by Total Colectomy.
 MR. GRAEME ANDERSON—St. Mark's Hospital—9 to 12.

Wednesday July 29th

- DR. A. D. REID, DR. W. R. BRISTOW and DR. CLAUDE GOULDESBOUGH—St. Thomas' Hospital—10 to 12. X-ray and Electro-Therapeutics.
 MR. S. G. SHATTUCK—St. Thomas' Hospital—9 to 12. Pathological Laboratory.
 SIR ARBUTHNOT LANE and MR. C. H. FAGGE—Guy's Hospital—12. Cases of Intestinal Stasis and Obstruction.
 MR. T. B. LAYTON—Guy's Hospital—12. Examination of cases by means of Killian's swinging laryngoscope. Test of the vagus nerve in cases of disease of the ear and brain. Cases of paralysis of the larynx and allied conditions.
 MR. J. A. EDMOND—Guy's Hospital—1.30. Cases of Syphilis of the nose and throat, treated by methods used in the British Army.
 MR. JAMES BERRY—Royal Free Hospital—9 to 12. Surgical Cases.
 MR. GAY FRENCH—Royal Free Hospital—10 to 12. Throat, Nose and Ear Cases.

- MR. JOCELYN SWAN—Cancer Hospital—4.30. Tumor of the Kidneys.
 MR. O. L. ADDISON—Hospital for Sick Children—10 to 12. Cases of Syphilitic Osteitis in Children.

Thursday July 30th

- DR. R. S. TREYOR—St. George's Hospital—10 to 12. Pathological Specimens in the Museum.
 MR. J. CUNNING—Royal Free Hospital—10 to 12. Surgical Cases.
 MRS. VAUGHAN SAWYER—Royal Free Hospital—10 to 12. Gynaecological Cases.
 MR. J. CUNNING—Cancer Hospital—4.30. Case of the Breast.
 DR. G. F. STILL—Hospital for Sick Children—10 to 12. Congenital Pyloric Stenosis.
 MEMBERS OF THE STAFF—Demonstrations in the Out-Patient Department—St. Peter's Hospital—10 to 12.
 MR. CUTBERT WALLACE—St. Thomas' Hospital—4.30. Demonstration of Prostatic Specimens.

Friday July 31st

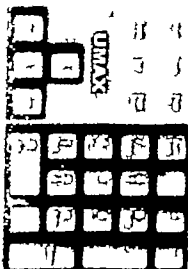
- DR. W. S. FOX and DR. G. A. SIMMONS—St. George's Hospital—10 to 12. X-ray and Electro-Therapeutics Department.
 DR. W. D'ESTS EMERY—King's College Hospital—9 to 12. Pathological Laboratory.
 MR. C. A. PANNETT—Royal Free Hospital—10 to 12. Surgical Cases.
 DR. L. U. WILLIAMS—Royal Free Hospital—10 to 12. X-ray Department.
 DR. F. E. BATTEN—Hospital for Sick Children—10 to 12. The Use of Celluloid Splints in the Treatment of Acute and Chronic Infantile Paralysis.
 MR. GEORGE WAUGH—Hospital for Sick Children—4 to 5. End-Results of Acute Otitis Media.
 MR. L. E. C. NORBURY—St. Mark's Hospital—9 to 12.

Saturday August 1st

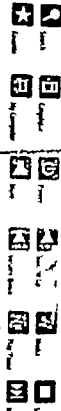
- DR. ROBERT KNOX—King's College Hospital—12. Radiography.
 DR. SILK and MR. F. F. BURGHARD with the assistance of the architect and consulting engineer will show letters over the new building and explain the plans—King's College Hospital—12 to 1.
 MRS. WILLEY—Royal Free Hospital—9 to 12. Gynaecological Cases.
 MR. T. H. KELLOCK—Hospital for Sick Children—9.30 to 1.30. End-Results of Operative Procedures.

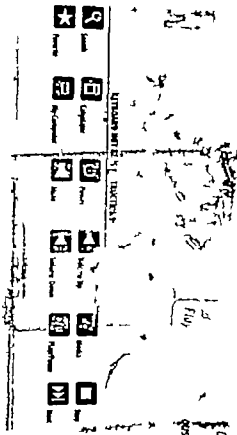
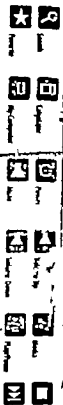
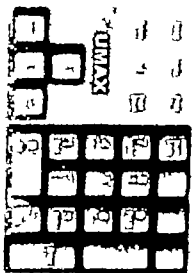
Days and Hours to be observed

- DR. GILBERT SCOTT—London Hospital—The X-ray in Treatment and Diagnosis.
 DR. J. H. BIQUEIRA—London Hospital—Cases of Skin Diseases of Surgical Interest.



APPENDIX 1





CLINICAL CONGRESS OF SURGEONS OF NORTH AMERICA

EDWARD MARTIN President

GEORGE E. BRISWEE, President Elect

W W CHIPMAN Vice-President Elect

FRANKLIN H. MARTIN General Secretary

ALLEN B. KANAVAL, General Treasurer

A. D. BAILLOU General Manager

COMMITTEE ON ARRANGEMENTS FOR THE CHICAGO MEETING

E. WELLS ANDREWS, Chairman

FRANK T. ANDREWS

CHARLES S. BACON

W. L. BAUM

CARL BECK

JOSEPH BECK

FREDERICK A. BESLEY

ARTHUR DEAN BRYAN

LEWIS W. BRECHERMAN

TRUMAN W. BROPHY

JAMES BUREY

H. R. CHASE

WM. R. CURRIE

CHARLES DAVISON

JOSEPH B. DELEE

PHILIP S. DOANE

W. A. NEWMAN DONLAD

DANIEL N. EISENBERG

JACOB FRANK

ROBERT T. GELBERG

T. OMAR L. GILMER

D. W. GRAMM

A. L. HALSTEAD

T. MELVILLE HARDY

M. L. HARRIS

L. HERTSON

CHARLES E. KANLKE

ALLEN B. KANAVAL

DEAN D. LEWIS

GEORGE P. MARQUIS

FRANKLIN H. MARTIN

L. L. MCARDUR

FREDERICK MEXOR

JOSH B. MORPHY

ALBERT J. OGDON

J. R. PENNINGTON

NORVAL H. PIERCE

JOHN L. PORTER

HOLLIS E. POTTER

EDWIN W. RYDERSON

LOUIS E. SCHMIDT

W. E. SCHROEDER

D. A. K. STEELE

GEORGE F. SOKER

THOMAS J. WATKINS

J. CLARENCE WEBSTER

WM. H. WILDER

CARST A. WOOD

THE FOURTH CLINICAL CONGRESS IN CHICAGO

WHILE the chief attraction of the annual sessions of the Congress will always be the elaborate clinical programs which can be provided in the larger cities on this continent, special pains are taken to provide scientific programs for the evenings that will prove interesting and attractive in themselves. At this year's meeting the Congress will be honored by the presence of a number of eminent surgeons from abroad, who will take an active part in discussing topics of live surgical interest. With the selection of several prominent American surgeons the programs are now complete and these evening meetings cannot fail to be of very great interest. It is with pleasure that we present herewith portraits of a number of the men who will participate in these programs.

ALUMNI REUNIONS AND DINNERS

The local alumni associations of the medical schools of Chicago have taken advantage of the fact that hundreds of the graduates of these schools will attend the Fourth Session of the Congress and have arranged for alumni dinners and smokers on Thursday evening, November 13th. Tickets for any of these dinners may be obtained at headquarters at the Hotel LaSalle or the

Hotel Sherman or from the secretaries of the organizations. The entertainments are arranged for early hours in order that the men may attend the Cancer Meeting which is to be held on the same evening in Orchestra Hall.

RUSH.—The Alumni Association of Rush Medical College will hold its dinner at 6 o'clock in the Louis XVI Room of the Hotel Sherman. The Secretary of the Association is Dr. Arthur M. Corwin, 15 E. Washington Street. Alumni headquarters will be at the Sherman also.

NORTHWESTERN.—The Alumni Association of Northwestern University Medical School will give a dinner at 6:15 at the Blackstone Hotel. The Secretary is Dr. Arthur B. Eustace, 438 Indiana Avenue.

UNIVERSITY OF ILLINOIS.—The Alumni of the College of Medicine of the University of Illinois, formerly the College of Physicians and Surgeons, will have headquarters at the Illini Club 314 S. Federal Street. The dinner will be given at 6 o'clock at the University Club. The Secretary is Dr. G. J. Lorch, 1800 W. Chicago Avenue.

HAHNEMANN.—The Alumni Association of Hahnemann Medical College will give a dinner followed by a smoker with special entertainment for members and their friends, the place and hour

to be announced later. Tickets may be obtained of Dr. A. H. Gordon, Chairman of the Executive Committee, 858 La Salle Avenue, or at the College office.

CHICAGO NEUROLOGICAL SOCIETY

This society will hold its regular monthly meeting on Saturday evening, November 8th, at 8:30 o'clock in the Gold Room of the Congress Hotel. The principal speaker of the evening will be Professor Harvey Cushing of Harvard University. His subject will be "The Year's Experiences in Neurologic Surgery." The following surgeons will participate in the discussion: Charles A. Ehlers of New York City, Ernest Sachs of St. Louis, and Albert E. Halstead of Chicago.

Invitations have been sent out by the Secretary of the Society, Dr. D'Orsay Hecht, 104 S. Michigan Avenue. Members of the Congress will be

admitted upon presentation of programs which will be issued at headquarters.

CHICAGO GYNECOLOGICAL SOCIETY

A special meeting of this society will be held on Saturday evening, November 15th, at 8:15, in the Florentine Room of the Congress Hotel in honor of its two distinguished guests, Professor Dr. Krönig and Professor Dr. Gauss of Freiburg, Germany. Among the papers to be read at this meeting are the following:

Robert L. Dickinson, Brooklyn: One-Stitch Perineorrhaphy and Two-Stitch Hysterectomy as Examples of Efficiency Methods.

Thomas S. Cullen, Baltimore: The Uterus and Its Diseases.

The society through its Secretary, Dr. Robert T. Gillmore, extends an invitation to all members of the Congress to attend this meeting.

For the benefit of those who may have overlooked the matter published in last month's issues we reprint herewith the detailed arrangements which have been made with regard to registration, headquarters, daily bulletins of clinics, etc., together with the clinical and evening programs corrected to date.

THE CLINICAL PROGRAM

Dr. Albert J. Ochsmere, the first President of the Congress, was selected as Chairman of the Committee on Clinical Programs for the fourth session of the Congress, and under his supervision an attractive program has been provided. Every clinician of ability and reputation in Chicago will be ready to do his share in entertaining the hundreds of guests who are expected to attend. The program as printed on the following pages, however, must be considered merely as an outline of what the clinicians of Chicago expect to do. The daily program as bulletined at headquarters will be more extensive and will give in detail the nature of the operative work and demonstrations. A complete showing of this city's clinical facilities will be made. Every branch of surgery will be represented in the program: gynecology, obstetrics, genito-urinary surgery, orthopedics, surgery of the eye, ear, nose, throat and mouth. One will find enough actual surgical work in any one of the specialties to keep him busy each day of the session. In addition to clinics in operative surgery, a large number of special demonstrations in radiology, experimental surgery, surgical pathology, etc., will be provided.

The Committee on Hospitals announces that more than 2000 members may be accommodated at all times in the larger amphitheaters, and in addition there are numerous clinics where small groups of from ten to forty may be accommodated. Attendance upon the special demonstrations will be limited to small groups, for which special tickets will be distributed at headquarters.

HEADQUARTERS

The Committee on Arrangements, with Dr. E. Wyllys Andrews as its Chairman, has arranged to comfortably care for a large attendance, bearing in mind the probability that there would be a greater number of visiting surgeons than were registered at the New York meeting. Thus, by providing headquarters at two separate hotels, overcrowding will be eliminated. General headquarters will be located at the Hotel LaSalle where the entire eighteenth and nineteenth floors have been reserved for the use of the Congress. Here each member will register on arrival to obtain his membership card and button.

The fourth session will be limited to one week, the clinics beginning on Monday morning and continuing up to Saturday afternoon. I order that the entire week may be utilized by the visiting surgeons, headquarters at both the Hotel LaSalle and Hotel Sherman will be open on the afternoon and evening of Saturday and all day Sunday, November 8th and 9th.

To facilitate the work of registration, visiting surgeons are urged to plan to arrive in Chicago not later than Sunday and to register promptly.

even arrival so that they may be ready for the early clinics on Monday morning. Arrangements have also been made for registration in advance for those who wish to secure their membership cards previous to arrival in Chicago. This may be done by forwarding the registration fee with the acceptance card which is sent with each invitation.

Separate headquarters for the Division of Surgical Specialties, which includes Surgery of the Eye, Ear, Nose, Throat and Mouth, will be established on the second floor of the Hotel Sherman, three blocks from the Hotel LaSalle. Large bulletin boards will be placed in the Louis XVI Room on which will be posted each day the schedule of all clinics in these specialties. In this room also will be held the evening session of this section of the Congress.

DAILY BULLETINS AND PROGRAMS

During the afternoon of each day the session there will be bulletined at headquarters a complete, accurate program of the clinics and demonstrations to be given on the succeeding day. These bulletins will be displayed on large boards in the Ballroom at the Hotel LaSalle. In the Louis XVI Room of the Hotel Sherman printed programs will be issued daily containing all clinics, demonstration evenings, sessions, luncheon meetings, etc. The complete program for Monday will be posted on Saturday afternoon.

MEMBERSHIP IN THE CONGRESS

Any physician or surgeon of North America in good standing may become a member of the Clinical Congress by registering at the annual meeting and paying the regular fee of \$5.00. A non-resident physician who registers at the Congress and who registers at the Congress at members of the Congress will receive a full program of the Congress. All who register at the Congress will receive a full program of the Congress. The General Secretary.

REGISTRATION

Registration for the Congress will be held at the Hotel Sherman, Chicago, from Monday, September 1st, to Friday, September 5th, from 10:00 a.m. to 6:00 p.m. Registration for the Congress will be held at the Hotel Sherman, Chicago, from Monday, September 1st, to Friday, September 5th, from 10:00 a.m. to 6:00 p.m. Registration for the Congress will be held at the Hotel Sherman, Chicago, from Monday, September 1st, to Friday, September 5th, from 10:00 a.m. to 6:00 p.m.

meet the expense of preparing for and conducting the annual meeting. In order that no financial burden may be imposed upon the members of the profession in the city entertaining the Congress, judging from past experience the amount received from such fees will be barely sufficient for the purpose so that payment of the fee is expected of all who register.

MEMBERSHIP CARDS

It will be absolutely necessary for each surgeon who desires to attend the clinics and evening sessions to register at headquarters and secure a membership card. Admission to all clinics and evening sessions will be strictly limited to members of the Congress upon presentation of such membership cards.

EVENING MEETINGS

There will be eight evening sessions at which scientific papers will be read and discussed by distinguished American and European surgeons. Included in the Presidential Meeting. One of these sessions will be devoted to general surgical topics. For three of these the convenience and comfort of the Orchestra Hall has been secured, the other two meetings will be held in the Grand Room of the Congress Hotel.

One of the auditors of the Committee on Surgical Sessions, having in charge the program for those interested in Surgery of the Eye, Ear, Nose, Throat and Mouth, there will be three evening meetings in the Louis XVI Room of the Hotel Sherman.

The complete programs for the evening sessions will be distributed at headquarters.

PRESIDENTIAL MEETING

The first Presidential Meeting will be held on Monday evening, September 1st, at 8:00 p.m. in the Orchestra Hall. At this time the President, Dr. George E. May, of New York City, will be elected. I will be elected as President. The President of the American Medical Association and the Canadian Medical Association will be present. The meeting will be held at the Congress Hotel.

CLINICAL SESSIONS

There will be eight clinical sessions on Monday, September 1st, from 10:00 a.m. to 6:00 p.m. The sessions will be held in the Louis XVI Room of the Hotel Sherman. The sessions will be held in the Louis XVI Room of the Hotel Sherman.

public in regard to the importance of the early recognition of cancer and the importance of treating the disease in its early stages.

RAILROAD RATES AND TRAFFIC ARRANGEMENTS

Special rates have been granted for this session of the Congress in certain parts of the country including practically all of the states east of the Mississippi River and the eastern provinces of Canada. The details of these special rates may be had upon application to the local representatives of any of the roads. Certain of the railroads are making special traffic arrange-

ments to care for the men who will come to Chicago at this time. From the Eastern States and Canada, the New York Central Lines, the Pennsylvania Lines and the Grand Trunk Railway; from the South, the Chicago and Eastern Illinois, from the West, Southwest and Northwest, the Santa Fe and the Chicago, Milwaukee and St. Paul railways. Members of the Congress are urged to patronize these roads as the officials of the several lines have been kind enough to assist the management of the Congress in its plans for making the Chicago session of the Congress the greatest in its history.

PROGRAM OF EVENING SESSIONS

GENERAL SURGICAL DIVISION

Presidential Meeting Monday November 10th in Orchestra Hall

Address of Welcome by E. WYLLIS ANDREWS, Chairman of Committee on Arrangements.

EDWARD MARTIN, Philadelphia. Address of retiring president.

Brief Addresses by Presidents of the National Medical Societies.

Inauguration of President BARNES.

GEORGE EMERSON BREWER, New York City: A New Method of Pyloric Closure in Gastro-enterostomy.

HARVEY CURRIE, Boston: A Report of Series of 30 Gammaria Oesophagus Operations.

Discussion by JOHN R. McFARLANE, Chicago.

Tuesday November 11th in Orchestra Hall

HERBERT J. PATTERSON F. R. C. S. London: The Operation of Gastro-jejunostomy and the Principles Which Should Determine Its Use.

Discussion by CARL BECK, Chicago.

JOHN B. DEAY, Philadelphia: Gastric Hemorrhage.

Discussion by A. J. OCHSNER, Chicago.

PROFESSOR TUFFIER, Paris: Grafting of the Human Ovary.

Discussion by ALBERT C. REEL, New York City.

Wednesday November 12th in the Gold Room Congress Hotel

PROFESSOR DOCTOR KROG, Freiburg, Germany: The Radio-Therapeutic Treatment of Benign and Malignant Tumors.

Discussion by HOWARD KELL, Baltimore and C. J. C. LEE, Freiburg, Germany.

HUGH CAROT, Boston: The Diagnosis of Lesions of the Upper Urinary Tract.

Discussion by ARTHUR DE BEVA, Chicago.

J. M. T. FRYER, Baltimore: Fourteen Years' Experience with the Operation of Pyloroplasty.

Discussion by E. WYLLIS ANDREWS, Chicago.

Cancer Meeting Thursday November 13th in Orchestra Hall

THOMAS B. COLLIER, Baltimore: (a) Report of the Cancer Campaign Committee of the Clinical Congress of Surgeons of North America. (b) The Diagnosis of Cancer of the Uterus.

Mrs. SARAH HOPKINS ADAMS, New York City: Publicity Through the La Presse.

EDWARD RICHMOND, Boston: Publicity and Education Through the American Society for the Control of Cancer.

FREDERICK R. GREEN, Chicago: Publicity and Education Through the Council on Health and Public Instruction of the American Medical Association.



SIR W. ARNCLIFFE LANE, London, England



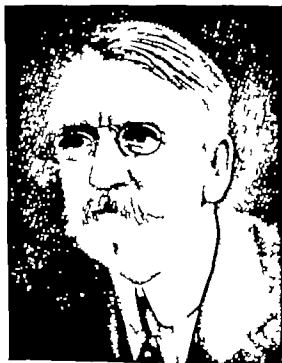
PROFESSOR DOCTOR KRÖNIG Frankfurt, Germany



HERBERT J. PATERSON, London, England



J. M. T. FINNEY Baltimore



JOHN B. DEAVER, Philadelphia



CHARLES H. MAYO, Rochester, Minnesota



J. F. HEXTER, Kansas City, Missouri



HUGH CABOT, Boston



ROSWELL PARK, Buffalo



V. P. BLAIR, St. Louis



O. HUDSON MAXSON Philadelphia



FRED WHITING New York City



H. GOLD CLIFFORD Omaha

- MR. FREDERICK L. HOFFMAN, Newark: The Educational Value of Cancer Statistics to Insurance Companies, the Public, and the Medical Profession.
- JAMES E. TRO, New York City: The Relation of the Pathological to the Surgical Diagnosis of Cases of Cancer.
- LIVINGTON FARRAND, New York City: Chairman. National Association for the Study of the Prevention of Tuberculosis: How the Education Campaign on Cancer May Parallel the Educational Campaign on Tuberculosis.
- WILLIAM J. MAYO, Rochester, Minnesota: Cancer of the Stomach and Colon.
- C. J. GATHE, Freiburg, Germany: The Radio-Therapeutic Treatment of Carcinoma.
- JOSPH C. BLOODGOOD, Baltimore: A Very Recent Investigation of the Outcome of the Cases of Cancer Recorded in the Johns Hopkins Hospital and the Surgical Pathological Laboratory (Lantern Demonstration)

Friday November 14th in the Gold Room Congress Hotel

- ER W. ARBUTHNOT LANE, London: Title of paper to be announced.
- ROSWELL PARK, Buffalo: On the Relation of the Ductless Glands to the Work of the Surgeon.
- Discussion by DEAN D. LEWIS, Chicago
- JOHN F. BIDOT, Kansas City: Some Uses of Fat in Surgery
- Discussion by JAMES HALPENY, Winnipeg, Manitoba
- CHARLES H. MAYO, Rochester, Minnesota: A Summing Up of the Garter Question.
- Discussion by GEORGE W. CHASE, Cleveland.

DIVISION OF SURGICAL SPECIALTIES

Tuesday November 11th in the Louis XVI Room Hotel Sherman

- Opening Address by E. WYLLIS ANDREWS, Chairman of Committee on Arrangements.
- EDWARD JACKSON, Denver: Operations on the Extraocular Muscles
- Discussion by C. H. BEARD and GEORGE F. FISKE
- HAROLD GIFFORD, Omaha: Sympathetic Ophthalmia.
- Discussion by E. V. L. BROWN and J. D. LORING.
- ROBERT H. ELLIOTT, M. D., F. R. C. S., Lt.-Col. I. M. S. Superintendent Government Ophthalmic Hospital, Madras, India, will also address the meeting.

Wednesday November 12th in the Louis XVI Room Hotel Sherman

- G. HEDDOY MAXUEN, Philadelphia: Surgery of the Facial Tonsil as it Relates to the Functions of the Tongue and Soft Palate in the Production of the Voice.
- Discussion by W. E. CAMERLIERE and ELMER KENTON.
- V. P. BLAIR, St. Louis: Peridental Infections: Their Relation to Neighboring Organs.
- Discussion by ARTHUR D. BLACK and HERBERT A. PORTS

Friday November 14th in the Louis XVI Room Hotel Sherman

- FRED WATKINS, New York City: The Indications for the Radical Mastoid Operation with the Steps Essential to Successful Healing.
- Discussion by FRANK ALLPORT and JOSEPH BECK.
- PHILIP D. KERRIDGE, New York City: The Surgical Treatment of Suppurative Labyrinthitis.
- Discussion by GEORGE E. SHAM, CH. and J. GORDON WILSON.

PRELIMINARY CLINICAL PROGRAM

SURGICAL CLINICS

COMMITTEE A. J. OCHNER, Chairman, CARL BECK, FREDERIC A. DESLEY, ALLEY B. KANAVEL, and LAWRENCE RYAN

Monday November 10th

A. J. OCHNER — Argentine Hospital — 8 to 1.
 JACOB FRANK — Columbus Hospital — 9 to 10.
 C. VOJNIT — Columbus Hospital — 9 to 10.
 CHARLES DAVINIS — Cook County Hospital — 9 to 10.
 A. BELCHAM KEVLS — Cook County Hospital — 9 to 10.
 M. W. BACON — Englewood Hospital — 9 to 10.
 W. M. H. BOHART — Englewood Hospital — 10 to 11.
 W. M. FULLER — Englewood Hospital — 10 to 11.
 SYLVAN KUNZ — German Hospital — 10 to 11.
 L. E. HENDERSON — House of Correction Hospital — 10 to 11.
 BENJAMIN H. BREAKSTONE — Jefferson Park Hospital — 10 to 11.
 A. P. HEINCK — Jefferson Park Hospital — 10 to 11.
 GILBERT H. WYNKOP — Lake View Hospital — 10 to 11.
 BENJAMIN H. BREAKSTONE — Maimonides Hospital — 10 to 11.
 JOHN B. MURPHY — Mercy Hospital — 10 to 11.
 E. WYLLIS ANDREWS — Michael Reese Hospital — 10 to 11.
 EMANUEL FRIEND — Michael Reese Hospital — 10 to 11.
 CARL BECK — North Chicago Hospital — 10 to 11.
 EMIL G. BECK — North Chicago Hospital — 10 to 11.
 (Ninth work only)
 S. DAIL — Norwegian Des Moines Hospital — 9 to 10.
 M. L. HARRIS — Park Hotel — 10 to 11.
 NORMAN KERR — Park Hotel — 10 to 11.
 J. R. PENNINGTON — Park Hotel — 10 to 11.
 G. S. BUSH — Park Hotel — 10 to 11.
 G. W. GREEN — Park Hotel — 10 to 11.
 ARTHUR DEAN BRYAN — Rush Medical College — 9 to 10.
 C. G. BUTORI — Rush Medical College — 9 to 10.
 CARL WAGNER — Rush Medical College — 9 to 10.
 W. H. ALPHEE — Rush Medical College — 9 to 10.
 T. A. DAVIS — West Side Hospital — 10 to 11.
 EDWARD M. BROWN — West Side Hospital — 10 to 11.
 T. J. CONLEY — West Side Hospital — 10 to 11.
 J. V. FOWLER — Willard Hospital — 10 to 11.

Tuesday November 11th

N. M. PIRCY — Argentine Hospital — 8 to 10.
 C. G. BUTORD — Children Memorial Hospital — 8 to 10.
 FRANK BYRNES — Columbus Hospital — 9 to 10.
 JAMES J. McINN — Columbus Hospital — 9 to 10.
 LAWRENCE RYAN — Cook County Hospital — 9 to 10.
 FRIEDRICH L. VAS — Cook County Hospital — 9 to 10.
 C. F. P. KORSILL — Englewood Hospital — 9 to 10.
 JOSEPH REISE — Englewood Hospital — 9 to 10.
 A. C. ZIMMERMAN — German Hospital — 9 to 10.
 PAUL GRONFELD — German Hospital — 9 to 10.
 C. L. WYNEKOP — Lake View Hospital — 9 to 10.
 BENJAMIN H. BREAKSTONE — Maimonides Hospital — 9 to 10.
 E. WYLLIS ANDREWS — Mercy Hospital — 8 to 10.

L. A. GREENFELDER — Michael Reese Hospital — 8 to 10.
 L. L. McARTHUR — Michael Reese Hospital — 9 to 10.
 I. A. L. SIBRATH — Michael Reese Hospital — 9 to 10.
 CARL BECK — North Chicago Hospital — 9 to 10.
 EMIL G. BECK — North Chicago Hospital — 9 to 10.
 (Ninth work only)
 WILLIAM HESSERT — Polkville Hospital — 9 to 10.
 ARTHUR D. LUTACE and R. WILLIAM McNEELY — Post-Graduate Hospital — 9 to 10.
 W. M. P. CUBBINS — Post-Graduate Hospital — 9 to 10.
 DEAN D. LEWIS — Post-Graduate Hospital — 9 to 10.
 GEORGE DE TARNOWSKI — Ravenswood Hospital — 9 to 10.
 CHARLES H. PARKES — Sherman Park Hospital — 9 to 10.
 C. H. M. KENNA — St. Joseph Hospital — 9 to 10.
 C. M. M. KENNA — St. Joseph Hospital — 9 to 10.
 A. F. HANSTAD — Lake View Hospital — 9 to 10.
 ARTHUR WERLHUS — South Shore Hospital — 9 to 10.
 A. F. HENNING — Washington Park Hospital — 9 to 10.
 W. A. SCHIFFER — Wesley Hospital — 8 to 10.
 J. A. BELEY — Wesley Hospital — 8 to 10.
 H. M. RICHTER — Wesley Hospital — 8 to 10.
 J. M. BROWN — West Side Hospital — 8 to 10.
 L. F. HENDERSON — Frances Willard Hospital — 8 to 10.

Wednesday November 12th

A. C. ZIMMERMAN — Mexican Brothers Hospital — 9 to 10.
 A. J. OCHNER — Argentine Hospital — 8 to 10.
 W. M. FULLER — Park Hotel — 10 to 11.
 W. M. HARRIS — Park Hotel — 10 to 11.
 JACOB FRANK — Columbus Hospital — 9 to 10.
 C. VOJNIT — Columbus Hospital — 9 to 10.
 CARL BECK — North Chicago Hospital — 9 to 10.
 FRANKLIN A. WEATHERS — Englewood Hospital — 9 to 10.
 SYLVAN KUNZ — German Hospital — 10 to 11.
 J. V. FOWLER — House of Correction — 10 to 11.
 I. A. L. SIBRATH — Lake View Hospital — 10 to 11.
 GILBERT H. WYNKOP — Lake View Hospital — 10 to 11.
 BENJAMIN H. BREAKSTONE — Maimonides Hospital — 10 to 11.
 JOHN B. MURPHY — Mercy Hospital — 8 to 10.
 E. WYLLIS ANDREWS — Michael Reese Hospital — 8 to 10.
 EMANUEL FRIEND — Michael Reese Hospital — 8 to 10.
 CARL BECK — North Chicago Hospital — 8 to 10.
 E. L. HENDERSON — Norwegian Des Moines Hospital — 8 to 10.
 C. G. BUTORD — Polkville Hospital — 8 to 10.
 J. R. PENNINGTON — Polkville Hospital — 8 to 10.
 WALLACE CROSVENOR — Ravenswood Hospital — 8 to 10.
 A. G. SCHIFFER — Ravenswood Hospital — 8 to 10.
 HUGH N. MACKENTIE — Rhodes Avenue Hospital — 8 to 10.

ARTHUR DEAN BEVAN — Rush Medical College — 9
to Borderland clinic with Dr. BENJAMIN H. BREAKSTONE.
LAWRENCE RYAN — St. Anthony's Hospital — to 2.
W. S. HECTOR, L. B. DONKLE, J. C. HEPBURN, W.
J. HURLEY, J. C. BELSAN and J. B. HAEBERLIN
(Joint Clinic) — St. Bernard's Hospital — to 4.
CARL WAGNER — St. Joseph's Hospital — to 2.
A. E. HALSTEAD — St. Luke's Hospital — 8 to 4.
CHARLES DAVISON — University Hospital — to 3.
E. M. BROWN — West Side Hospital — 8
A. P. HEINECK — West Side Hospital — 8 to 4.

Thursday November 15th

N. M. PERCY — Augustana Hospital — 8 to 4.
A. J. OCHSNER — College of P. and S. — to 3.
N. M. PERCY — College of P. and S. — to 3.
JAMES J. MCGUINN — Columbus Hospital — to 2.
FRANK BYRNES — Columbus Hospital — 9 to 4.
LAWRENCE RYAN — Cook County Hospital — 8 to 4.
E. WYLLYS ANDREWS — Cook County Hospital — 9 to 2.
FREDERICK G. DYAS — Cook County Hospital — 2.
A. G. ZIMMERMAN — German Hospital — 9 to 2.
PAUL GRONNERUD — German Hospital — to 4.
H. R. CHISLETT — Hahnemann Hospital — 8 to 3.
C. E. KAHLKE — Hahnemann Hospital — 8 to 3.
C. L. WYNEKOOP — Lak. View Hospital — 8 to 4.
BENJAMIN H. BREAKSTONE — Maimonides Hospital — to 4.
JOHN B. MURPHY — Mercy Hospital — 8 to 3 to 2.
CARL BECK — North Chicago Hospital — 9 to 4.
EMIL G. BECK — North Chicago Hospital — 9 to 4.
Barnuth work only.
WM. F. SCOTT — Oak Park Hospital — to 2.
M. L. HARRIS — Polyclinic Hospital — to 4.
ARTHUR B. EUSTACE and R. WILLIAM MCNEALY — Post-Graduate Hospital — 9 to 4.
CARL B. DAVIS — Presbyterian Hospital — to 4.
C. N. BUSWELL — Ravenswood Hospital — 8 to 4.
ARTHUR DEAN BEVAN — Rush Medical College — 9 to 4.
to Borderland clinic with Dr. FRANK BILLINGS.
C. H. M. KENNA — St. Joseph's Hospital — to 4.
C. G. BUFORD — St. Joseph's Hospital — to 4.
A. E. HALSTEAD — St. Luke's Hospital — 8 to 4.
W. H. ALLPORT — St. Luke's Hospital — 8 to 4.
WM. M. HARSHA — St. Luke's Hospital — 8 to 4.
AXEL WERELIUS — South Shore Hospital — 9 to 2.
D. A. K. STEELE — University Hospital — to 3.
F. A. BENTLEY — Wesley Hospital — 4 to 5.
PAUL B. MAGNUSON — Wesley Hospital — 9 to 2.
E. M. BROWN — West Side Hospital — 8 to 4.
C. C. ROGERS — Frances Willard Hospital — to 2.
ALLAN D. STEWART — Frances Willard Hospital — 3 to 5.

Friday November 14th

A. G. ZIMMERMAN — Alexian Brothers Hospital — 9 to 4.
A. J. OCHSNER — Augustana Hospital — 8 to 4.
EDWARD M. BROWN — College of P. and S. — to 3.
JACOB FRANK — Columbus Hospital — 9 to 12.
C. VOLINI — Columbus Hospital — 9 to 4.
F. A. BENTLEY — Cook County Hospital — to 2.
GEORGE F. THOMPSON — Cook County Hospital — 8 to 4.
H. M. RICHTER — Cook County Hospital — 3 to 4 to 3.
SYLVAN KUNZ — German Hospital — to 2.

GILBERT H. WYNEKOOP — Lak. View Hospital — to 2.
BENJAMIN H. BREAKSTONE — Maimonides Hospital — to 4.
E. WYLLYS ANDREWS — Mercy Hospital — 8 to 4.
L. A. GREENSFELDER — Michael Reese Hospital — 8 to 10.
L. L. MCARTHUR — Michael Reese Hospital — 9 to 2.
D. N. EISENDRATH — Michael Reese Hospital — 9 to 2.
EMANUEL FRIEND — Michael Reese Hospital — 8 to 3.
CARL BECK — North Chicago Hospital — 9 to 4.
J. R. PENNINGTON — Polyclinic Hospital — to 4.
WILLIAM HESSERT — Polyclinic — to 4.
CHARLES J. ROWAN — Presbyterian Hospital — to 4.
G. N. BUSSEY — Ravenswood Hospital — to 2.
G. W. GREEN — Ravenswood Hospital — 8 to 4.
ARTHUR DEAN BEVAN — Rush Medical College — 9 to 4.
to Borderland clinic with Dr. J. B. HENNING.
CARL WAGNER — St. Joseph's Hospital — to 2.
M. J. SEIFERT — St. Mary's of Nazareth Hospital — 8 to 10.
A. F. HENNING — Washington Park Hospital — 9 to 2.
D. A. K. STEELE — University Hospital — to 3 to 4.
CHARLES DAVISON — University Hospital — 9 to 4 to 5.
ALLEN B. KANAVEL — Wesley Hospital — 4 to 5.
PAUL B. MAGNUSON — Wesley Hospital — 9 to 2.
T. J. CONLEY — West Side Hospital — to 2.
G. C. AMERSON — West Side Hospital — 9 to 4.

Saturday November 15th

N. M. PERCY — Augustana Hospital — 8 to 4.
JAMES J. MCGUINN — Columbus Hospital — 9 to 4.
FRANK BYRNES — Columbus Hospital — 9 to 2.
A. COSMOS GARVY — Columbus Hospital — to 4.
FREDERICK G. DYAS — Cook County Hospital — 8 to 4.
E. WYLLYS ANDREWS — Cook County Hospital — 9 to 2.
C. E. HUMISTON — Cook County Hospital — to 4.
A. BELCHAM KEYES — Cook County Hospital — 3 to 6.
PAUL F. MORF — Cook County Hospital — to 4.
A. G. ZIMMERMAN — German Hospital — 9 to 2.
H. R. CHISLETT — Hahnemann Hospital — 8 to 3.
C. E. KAHLKE — Hahnemann Hospital — 8 to 3.
C. L. WYNEKOOP — Lak. View Hospital — 8 to 4.
BENJAMIN H. BREAKSTONE — Maimonides Hospital — to 4.
JOHN B. MURPHY — Mercy Hospital — 8 to 3 to 2.
CARL BECK — North Chicago Hospital — 9 to 4.
EMIL G. BECK — North Chicago Hospital — 9 to 4.
Barnuth work only.
S. DAHL — Norwegian Deaconess Hospital — 9 to 4.
COLEMAN G. BUFORD — Polyclinic Hospital — to 4.
PAUL GRONNERUD — Polyclinic Hospital — to 4.
W. J. MARVEL — Post-Graduate Hospital — to 4.
D. W. GRAHAM — Presbyterian Hospital — to 5.
W. H. ALLPORT — St. Luke's Hospital — 8 to 4.
AXEL WERELIUS — South Shore Hospital — 9 to 2.
W. L. SCHROEDER — Wesley Hospital — to 12.
E. M. BROWN — West Side Hospital — 8 to 4.

Days and Hours to be Announced

JAMES BERRY — Illinois Steel Co. Hospital.
WILLIAM HESSERT — Alexian Brothers and St. Joseph's Hospitals.
S. C. PLUMMER — St. Luke's Hospital.

GYNECOLOGICAL AND OBSTETRICAL CLINICS

COMMITTEE. J. CLARENCE WEBSTER, Chairman, FRANK T. ANDREWS, CHARLES S. BACON, and THOMAS J. WATKINS

Monday November 10th

CHANNING W. BARRETT—Cook County Hospital—
8 to 9.
CAREY CULBERTSON—Cook County Hospital—8.
ALBERT GOLDSPOIN—Evangelical Deaconess Hos-
pital—9 to 1.
E. B. ANDERSON—Eaglevood Hospital—9 to 10.
S. L. FRIDUSS—Eaglevood Hospital—10 to
THEODORE J. DOEDERLEIN—German Hospital—9.
FRANK T. ANDREWS—Mercy Hospital—8 to 10.
EMIL RIES—Post-Graduate Hospital—9.
HENRI SCHMITZ—St. Mary's Hospital—8 to 10.
WM. B. FEHRING—Rush Medical College—
ARTHUR H. CURTIS—Wesley Hospital—9.
ROBERT T. GILLMORE—Wesley Hospital—10 to 4.
MARK T. GOLDSTINE—Wesley Hospital—9 to 10.

Tuesday November 11th

G. J. HAGENS—Eaglevood Hospital—9 to 10.
S. A. WATERMAN—Eaglevood Hospital—10 to
PETER S. CLARK—Hahnemann Hospital—10.
JOHN W. BIRK—Lake View Hospital—10 to 4.
CHANNING W. BARRETT—Polklinik Hospital—
10 to 1.
A. BELCHAM KEYES—Polklinik Hospital—3 to 4.
CAREY CULBERTSON—Rush Medical College—
W. M. THOMPSON—St. Joseph's Hospital—9.
PHILIP S. DOANE—St. Joseph's Hospital—9 to 10.

Wednesday November 12th

CHANNING W. BARRETT—Cook County Hospital—
8 to 10.
HENRY F. LEWIS—Cook County Hospital—11 to 1.
E. C. DUDLEY—St. Luke's Hospital—1.
PETER S. CLARK—Hahnemann Hospital—10.
B. A. McBURNEY—Hahnemann Medical College—9 to 10.
W. B. BARNES—Mercy Hospital—8 to 10.
LESTER FRANKENTHAL—Michael Reese Hospital—9.
FRANK W. LYNCH—Presbyterian Hospital—10 to 1.
J. CLARENCE WEBSTER—Rush Medical College, Sans
Hall—10 to 1.
N. SPROUT HEANEY—Rush Medical College—
10 to 1.
E. C. DUDLEY—St. Luke's Hospital—1.
MARY G. McEWEN—Univ. Hospital—9 to 10.
ARTHUR H. CURTIS—Wesley Hospital—9.
MARK T. GOLDSTINE—Wesley Hospital—9 to 10.
HENRY SCHMITZ—Frances Willard Hospital—9 to 10.

Thursday November 13th

CAREY CULBERTSON—Cook County Hospital—8.
ALBERT GOLDSPOIN—Evangelical Deaconess Hos-
pital—9 to 1.

CHANNING W. BARRETT—Hennrich Hospital—
8 to 10.
JOHN W. BIRK—Lake View Hospital—10 to 4.
FRANK T. ANDREWS—Mercy Hospital—8 to 10.
C. V. BACHELLE—Polklinik Hospital—afternoon.
WM. B. FEHRING—Rush Medical College—1.
PHILIP S. DOANE—St. Joseph's Hospital—10 to 1.
CHARLES S. BACON—University Hospital—10 to 1.
ROBERT T. GILLMORE—Wesley Hospital—10 to 4.
THOMAS J. WATKINS—Wesley Hospital—9 to 10.
CHANNING W. BARRETT—West Side Hospital—
3 to 5.

Friday November 14th

W. B. BARNES—Mercy Hospital—8 to 10.
CHANNING W. BARRETT—Polklinik Hospital—
10 to 1.
A. BELCHAM KEYES—Polklinik Hospital—3 to 4.
CAREY CULBERTSON—Rush Medical College—
W. M. THOMPSON—St. Joseph's Hospital—9.
CHARLES S. BACON—University Hospital—10 to 1.

Saturday November 15th

CHANNING W. BARRETT—Cook County Hospital—
8 to 10.
LESTER FRANKENTHAL—Michael Reese Hospital—
9 to 10.
FRANK W. LYNCH—Presbyterian Hospital—
10 to 1.
J. CLARENCE WEBSTER—Rush Medical College, Sans
Hall—10 to 1.
N. SPROUT HEANEY—Rush Medical College—
10 to 1.
THOMAS J. WATKINS—Wesley Hospital—9 to 10.

Days and Hours to be Announced

E. S. BAILEY—Hahnemann Hospital.
HENRY T. BYFORD—West Side Hospital.
FRANK CARL.
W. A. NEWMAN DORLAND.
DAVID S. JILLIS—Prosser Hospital.
J. C. HONG—St. Luke's Hospital.
RUDOLPH W. HOLMES—Augustana Hospital.
GUSTAV KOLLSCHER.
FRANKLIN H. MARTIN—St. Luke's Hospital.
CHARLES E. PADDOCK—St. Luke's Hospital.
CHARLES B. REED—Wesley Hospital.
ERNEST SATRENIUS—West Side Hospital.
GEORGE SCHIDAU.
L. S. SIMON—Michael Reese Hospital.
HERBERT MARTIN STOWE.
BERTHA VAN HOOSEN—West Side Hospital.

ORTHOPEDIC CLINICS

COMMITTEE: E. W. RYERSON, Chairman WALLACE BLANCHARD CHARLES M. JACOBS, JOHN L. PORTER, and HENRY B. THOMAS

Monday November 10th

E. W. RYERSON—Children Memorial Hospital—
1 to 6 Polyclinic Hospital—1 to 2.
HENRY B. THOMAS—Cook County Hospital—8 to
1
THOMAS P. LYNAM—Home for Destitute Crippled
Children—1 to 4.
JOHN L. PORTER—St. Luke Hospital—1 to 2.
CHARLES M. JACOBS—West Side Dispensary (Mix
ed Street)—1 to 4.

Tuesday November 11th

JOHN L. PORTER—College of P. and S.—to
HENRY B. THOMAS—Cook County Hospital—8 to
St. Luke's Hospital—1
WALLACE BLANCHARD—Home for Destitute
Crippled Children—to 4

Wednesday November 12th

E. W. RYERSON—Children Memorial Hospital—3
to 6, Polyclinic Hospital—1
CHARLES M. JACOBS—Cook County Hospital—9
to 10, 1 to 4
HENRY B. THOMAS—Cook County Hospital—8 to
1; Polyclinic Hospital—1

JOHN L. PORTER—Home for Destitute Crippled Chil
dren—1 to 4.
P. B. MAGNUSON—Home for Destitute Crippled
Children—1 to 4.

Thursday November 13th

HENRY B. THOMAS—Cook County Hospital—8 to
St. Luke's Hospital—1 to 4.
E. W. RYERSON—Home for Destitute Crippled Chil
dren—1 to 4.

Friday November 14th

HENRY B. THOMAS—Cook County Hospital—8 to
WALLACE BLANCHARD—Home for Destitute Crip
pled Children—to 4.
E. W. RYERSON—Polyclinic Hospital—1 to 3

Saturday November 15th

CHARLES M. JACOBS—Home for Destitute Crippled
Children—1 to 4.
HENRY B. THOMAS—St. Luke Hospital—8 to

Days and Hours to be Announced

CHARLES M. JACOBS—Michael Reese Hospital

GENITO-URINARY SURGICAL CLINICS

COMMITTEE: LOUIS F. SCHMIDT, Chairman, WM. T. BELLFIELD, ROBERT H. HERBST, GUY KOLINSCHER, and VICTOR D. LEVINSON

Monday November 10th

L. W. BREMERMAN—Lakeside Hospital—1 to 4
B. C. CORBUS—Post-Graduate Hospital—4 to 6
GUSTAV KOLINSCHER, D. N. LEVINSON, I. S.
KOLL, and L. L. SCHMIDT—Michael Reese
Hospital—8 to
V. D. LEVINSON—Wesley Hospital—1 to 3

Tuesday November 11th

HARRY A. KRAUS, H. I. KRITZINGER, and L. L.
SCHMIDT—Meridian Brothers Hospital—8
HARRY A. KRAUS—German Hospital—1 to 4
GUY KOLINSCHER—Marion Wesley Hospital—to
ROBERT H. HERBST—Post-Graduate Hospital—1
WM. T. BELLFIELD—Rocky Mount College—1 to 3

Wednesday November 12th

F. KRITZINGER—Jefferson Park Hospital
HARRY A. KRAUS—Post-Graduate Hospital
B. C. CORBUS—Post-Graduate Hospital
N. L. MCINTOSH and L. L. SCHMIDT—Michael Reese
Hospital
GUY KOLINSCHER—Michael Reese Hospital
V. D. LEVINSON—Wesley Hospital

Thursday November 13th

L. W. BREMERMAN—Lakeside Hospital—8 to 10
ROBERT H. HERBST—Polyclinic Hospital—4 to 6
O. R. M. MARTIN—Polyclinic Hospital—1 to 2
J. S. NAGLE—West Side Hospital—3 to 5

Friday November 14th

H. I. KRITZINGER—Meridian Brothers Hospital—
8 to 10
HARRY A. KRAUS—Meridian Brothers Hospital—8
to 10
F. KRITZINGER—Jefferson Park Hospital—1 to 4
GUSTAV KOLINSCHER—Marion Wesley Hospital—9 to 11

B. C. CORBUS—Post-Graduate Hospital—4 to 6
LOUIS F. SCHMIDT—Michael Reese Hospital—9 to 11

WM. T. BELLFIELD—Rocky Mount College—1 to 3

V. D. LEVINSON—Wesley Hospital—1 to 3

Saturday November 15th

L. W. BREMERMAN—Lakeside Hospital—8 to 10
V. D. LEVINSON—Wesley Hospital—3 to 5

Saturday November 15th

J. HOLLINGER — Meridian Brothers Hospital — 9
 G. W. BOOF — Children's Memorial Hospital — 3 to 12
 Cook County Hospital — 1
 NORVAL HILLIER — Illinois Eye and Ear Infirmary — 2

J. GORDON WILSON — Northwestern University Medical School — 10
 THOMAS W. LEWIS, DANIEL B. HAYDEN, H. P. BACLEY, NATHAN SCHULMAN, LUTWIG MCGINNIS — Rush Medical College, Sears Hall — 3 to 4

ORAL SURGICAL CLINICS

COMMITTEE: THOMAS W. BROPHY, Chairman; THOMAS L. GILNER, and WM. H. G. LEE

THOMAS L. GILNER — St. Luke's Hospital — Wednesday, 6; Northwestern University Dental School — Friday, 10
 A. D. BLACK — St. Luke's Hospital — Wednesday
 HERBERT A. PUTTS — Presbyterian Hospital — Friday, 9; Northwestern University Dental School — Friday, 10

TRUMAN W. BROPHY — Frances Willard Hospital — Tuesday, 10 to 1; Presbyterian Hospital — Thursday, 2
 WILLIAM H. G. LEE — Frances Willard Hospital — Tuesday, 3 to 5
 FREDERICK B. MOOREHEAD — College of Dentistry, University of Illinois — Monday, 10 to 12; Presbyterian Hospital — Wednesday and Friday, 8 to 9

RADIOLOGY

COMMITTEE: HOLLIS E. POTTER, Chairman; JAMES T. CASE, and ADOLPH HARTUNG

Monday November 10th

A. L. VAN HORN — St. Luke's Hospital — 10 to 1
 General radiology
 L. S. TROSTLER — St. Joseph's Hospital — 9 to 10
 General radiology
 ALMA BRINDLEY — Wesley Hospital — 6 to 10
 General radiology

Tuesday November 11th

EMIL BECK — North Chicago Hospital — 10 to 1
 Stereo-radiography
 MAX REICHMANN — Private Laboratory — 10 to 1
 Diseases of bones
 HOLLIS E. POTTER — Private Laboratory — 4 to 5
 Radiography of the teeth and paranasal sinuses of the head
 JAMES T. CASE — St. Luke's Hospital — 8 to 10
 Fluoroscopic and radiographic examination of viscera
 A. L. VAN HORN — St. Luke's Hospital — 10 to 1
 General radiology
 L. S. TROSTLER — St. Joseph's Hospital — 9 to 10
 General radiology
 ALMA BRINDLEY — Wesley Hospital — 1 to 1
 General radiology

Wednesday November 12th

ADOLPH HARTUNG — Polak Hospital — 1 to 1
 Demonstration of stomach examination
 HERMAN L. KRITSCHNER and HOLLIS E. POTTER — Presbyterian Hospital — 10 to 1
 Pyelography, ureteral catheterization, radiography
 FRANCES E. TURLAY — Michael Reese Hospital — 6 to 1
 General radiology
 JAMES T. CASE — St. Luke's Hospital — 8 to 10
 Fluoroscopic and radiographic examination of viscera

A. L. VAN HORN — St. Luke's Hospital — 10 to 1
 General radiology

Thursday November 13th

EMIL BECK — North Chicago Hospital — 10 to 1
 Stereo-radiography
 HOLLIS E. POTTER — Private Laboratory — 4 to 5
 Radiography of mediastinum, heart and lungs
 MAX REICHMANN — Private Laboratory — 10 to 1
 Relative examination of diaphragm, tract
 FRANCES E. TURLAY — Michael Reese Hospital — 6 to 1
 General radiology
 JAMES T. CASE — St. Luke's Hospital — 8 to 10
 Fluoroscopic and radiographic examination of viscera
 L. S. TROSTLER — St. Joseph's Hospital — 9 to 10
 General radiology
 ALMA BRINDLEY — Wesley Hospital — 1 to 1
 General radiology

Friday November 14th

HOLLIS E. POTTER — Presbyterian Hospital — 1 to 1
 Fluoroscopic X-ray work
 FRANCES E. TURLAY — Michael Reese Hospital — 6 to 1
 General radiology
 JAMES T. CASE — St. Luke's Hospital — 10 to 1
 General radiology 10 to X-ray clinic (with lecture demonstration)

Saturday November 15th

ADOLPH HARTUNG — Polak Hospital — 10 to 1
 Demonstration of colon examination
 MAX REICHMANN — Private Laboratory — 1 to 1
 Dosimetry in Roentgen therapy
 L. S. TROSTLER — St. Joseph's Hospital — 10 to 1
 General radiology

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THE MOBILIZATION OF ANKYLOSED JOINTS

AN EXPERIMENTAL STUDY

By NATHANIEL ALLISON M. D. SAINT LOUIS

Assistant in Orthopedic Surgery Washington University

And

BARNEY BROOKS M. D. SAINT LOUIS

Assistant in Surgery Washington University

From the Surgical Laboratory of Washington University Medical School, Saint Louis

THIS experimental study was undertaken for the purpose of investigating the tissue changes which follow the interposition of certain substances between denuded joint surfaces believing that the facts gained from such a study must ultimately form the basis for the surgical treatment of ankylosis.

Experience has proven that better results are obtained by the use of organic rather than inorganic substances, and in these experiments only organic substances were used.

Helferich (1) is credited with the first success with the interposition method. In 1893 he exhibited to the Twenty third Congress of German Surgeons a child who had regained motion in bony ankylosis of the temporomaxillary joint after the interposition of flaps of temporal muscle. The use of muscle flaps was rapidly extended to other stiff joints by Rochet, Hoffa, Nelaton and others. Gluck (2) made use of skin flaps. Chlumsky (3) and Hoffa (4) have used non absorbable substances, such as plates of magnesium silver tin celluloid and rubber and later Hoffa used decalcified bone. J. B. Murphy (5) used flaps of fascia that contained as much

fat as possible. Kirschner (6) then demonstrated that fascia could be transplanted free and still retain its vitality and many operators have employed free fascia transplants. W. S. Baer (7) has employed chromicized pig's bladder.

In 1905 J. B. Murphy (5) reported two experiments on animals in which the hip joints were operated upon. After destruction of the joint surfaces a broad fascia flap with a pedicle was interposed. On dissection and microscopic study Murphy believed that the transplanted flaps of fascia led to the formation of a new joint cavity which he calls a bursa and which was analogous to the normal embryological development of a joint cavity.

Recently Sumita (8) has studied experimentally Payr's surgical treatment of ankylosis, using the hip the knee and the ankle joints of dogs. The joint surfaces were denuded of cartilage and pedunculated flaps of muscle tendon, and fascia were interposed. The results were studied by X ray dissection and microscopically. He finds that the interposed tissues undergo a fibrous degeneration which leads to the formation of a cavity which not only prevents bony union but also

takes on the characteristics of a joint cavity. Thus he thinks it more like a ganglion, as described by Ledderhose (9) than a bursa. Sumita believes that the pressure of the bones on the interposed tissue leading to hemorrhage and degeneration is the main factor in the production of this cavity. He believes also that it arises within the interposed tissue rather than around it. He also describes the interposed tissue as clinging to the denuded bone surfaces, like periosteum, thus inhibiting growth of bone. Sumita observed no marked difference in the behavior of the different tissues used but he feels that better results follow the use of fascia than of muscle or tendon.

Kirschner (6) has shown that free fascia transplants require very little nourishment and that they remain viable when transplanted into various tissues. Davis (10) reports the transplantation of fascia into a joint, where it remained alive preserving its morphological characteristics. Sumita dismisses the use of free fascia transplants into joints, with the statement that Payr has not succeeded with them clinically and that their ultimate fate is unknown.

Neff (5) reports four experimental arthroplasties on dogs, three of which died of infection. The fourth healed after the knee was excised and rectus aponeurosis was placed over the denuded femur, tibia, and patella. The dog lived four months. Dissection of the joint showed the capsule reformed and the tibia and femur separated by a pad of connective tissue which is firmly adherent to the bone above and below. This pad contained two bursal sacs, each one half inch in diameter and filled with clear thick fluid. These had formed where pressure was greatest. Mikroskopische examination showed walls of fibrous connective tissue in which the cells were closely packed together. There was no evidence of flattening of these cells.

In our study the operative method was as follows in all experiments, except for slight variations which are specifically indicated. The knee joint of the dog was used on account of its easy access. After the animal was completely anesthetized with ether the hair was removed by saturated solution of sodium

sulphide the skin was cleaned with soap water and alcohol and excluded from the operative field by towels immediately after incision. The joint cavity was opened by a lateral incision parallel to the patellar tendon. The patella and its tendon were displaced medianwards and turned over. The joint surface of the patella and the anterior surface of the femoral condyles were denuded of cartilage. The substance to be studied was then placed over the denuded femur and sutured in place with fine silk. The patella and its tendon were replaced. The joint was closed in layers with interrupted silk sutures. The skin was closed with Halsted's epithelial stitch. In some instances simply a collodion dressing was applied. In others, the limb was put up in semiflexed position with dry gauze and plaster of Paris dressing. The post-operative care of all animals was such as to prevent as much as possible pain and suffering. All animals were sacrificed with chloroform.

Twenty-six experiments were done on twenty-five dogs. Two infected knee-joints, as well as two instances in which an operation was done at the hip are not included in our study.

We have experimented with the following substances:

1. Cargyle's membrane
2. Free fascia from the fascia lata.
3. Pedunculated fascia flaps.
4. Chromicized pigs' bladder (Baer)
5. Fascia impregnated with metallic silver

Our primary object was not the study of functional results. In fact, we are inclined to doubt the possibility of producing a stiff joint by the experimental destruction of joint surfaces as above described.

In general, the point we sought to determine regarding these inserts and transplants was the behavior of the experimental joint as above described to these various substances, specifically to determine the possibility of the interposed substance healing in the length of time it may persist, the amount of reaction it produces, and its efficiency as a factor in the restoration of an anatomical articulation.

To obtain additional information as regards the behavior of the surrounding tissues to

these substances, we implanted them beneath the rectus abdominallis muscle.

The operative method above described produces a definite experimental condition which is as follows: Two joint surfaces, with the cartilage removed, are held in apposition, separated only by the experimental substance.

The results which follow this experimental condition without the interposition of any substance between the denuded surfaces were studied in three experiments. The following experiment alone is necessary of description.

Experiment No. 22 Usual operation patella and anterior femoral surfaces denuded, joint closed with nothing interposed between denuded surfaces, slightly flexed and fixed in plaster of Paris dressing. On the sixteenth day the plaster bandage was removed. Healing had taken place per primam. On the twenty-first day the animal was sacrificed. On opening the knee joint there was slight exudate of free fluid. The patella and quadriceps tendon were adherent to femur by a mass of new-formed connective tissue.

I. CAROYLE'S MEMBRANE

Experiment No. 28 Usual operation, piece of Cargyle's membrane was interposed between the denuded femur and patella. The joint was fixed in plaster.

Fifth day The plaster was removed. The wound was healing per primam. There was very little swelling. No discharge. The animal was sacrificed. On opening the joint it was found that the patella and quadriceps tendon were bound to the denuded femur by a mass of granulation tissue. The inserted membrane had entirely disappeared but for a small piece imbedded in the granulation tissue.

In experiment No. 14 performed previously to the above, the animal was sacrificed at the end of ten days, at which time the inserted Cargyle's membrane had completely disappeared. The denuded joint surfaces were bound together by newly formed connective tissue.

SUMMARY

From these experiments it is clear that Cargyle's membrane persists in joints less than ten days. The opposed joint surfaces became united by granulation tissue, as in the experiments where no substance was interposed.

II. FREE FASCIA TRANSPLANTS

Experiment No. 3 The usual operation as done on the right knee. The joint surface of the patella

was sawed off. The anterior joint surface of the femoral condyles was curetted down to bare bone. A piece of fascia lata was placed over the denuded femur and sutured in position with fine silk. The joint was closed with a collagen dressing applied. No plaster was used. Another piece of fascia lata was transplanted into the abdominal wall under the rectus muscle.

Third day Operative wounds show very little swelling and redness. No discharge.

Eighth day The animal is beginning to put some weight on the leg.

Twenty-seventh day Operative wounds have healed per primam. Animal walks on leg, with only a slight limp.

Twenty-ninth day Dog sacrificed. Passive motion unimpaired. There is some grating in the joint motion. On opening the joint cavity there is a slight excess of fluid, slightly blood-tinged. The joint surface of the patella is smooth but shows bare bone in spots. The patella has been slightly displaced, until it lies over the internal condyle. The denuded area of the femur is rough, but the surface is covered for the most part with a thin layer of translucent tissue. In areas, especially on the internal condyle over which the patella has rested, the bone is quite bare. The joint contains no adhesions. There is nothing in the joint which suggests a remnant of the fascia transplant.

The site of the fascia transplant in the abdominal wall was excised *en bloc*.

Microscopical study Microscopical sections were prepared of the patella, the denuded femur and site of the fascia transplant in the abdominal wall. The sections of the denuded femur showed the surface quite uneven. The greater portion of the surface is covered by a layer of newly formed fibrous tissue the cells of which are elongated and arranged in layers parallel to the free surface. In some areas the most superficial of these cells show a striking similarity to synovial membrane. In other areas the bone is quite bare. No trace of the fascia transplant is seen. The bone and the cartilage are especially interesting. Along the surface of the cancellous bone which had been denuded of its joint covering there is little or no evidence of new bone formation, the bone trabeculae being in the same condition apparently as they were left at the end of the operation. Along the lateral and medial sides of the condyles just under the joint cartilage which had not been interfered with in the operative procedure there are small islands of new bone formation. In the groove between the condyles, small

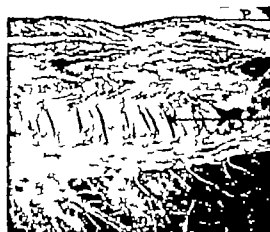


Fig. 2. Experiment No. 3. Free piece of fascia lata transplanted under the rectus abdominis muscle (twenty-eight day). T, transplant of fascia; M, rectus muscle; S, silk suture; P, peritoneum.

pieces of the joint cartilage had been left by the curette. These islands of cartilage show the normal flattened cartilage spaces changed into larger irregular spaces, which contain several cartilage cell nuclei. Beyond this, there was no evidence of cartilage regeneration.

Sections of the patella showed the free surface to be bare bone with no covering whatever. Attached to the patella tendon is a small tag of redematous fibrous tissue which may represent a small remnant of the fascia transplant.

Microscopic examination of the site of the transplantation of the fascia into the abdominal wall shows the transplant healed in so that it is continuous with the surrounding tissues. The normal histology is perfectly preserved. There is no evidence of degeneration and no sign of any cavity formation (Fig. 1).

Experiment No. 5. The same operative procedure carried out as in experiment No. 4. At the end of the operation the joint was dressed with dry gauze and put up in plaster of Paris in a semiflexed attitude.

Sixth day. Animal is in good condition. Plaster dressing is clean and intact.

Twentieth day. Plaster removed. Healing perfect. Animal looks thin.

Twenty-first day. The dog walks on the leg with limp. The joint is normal shape.

Twenty-second day. The animal has profuse nasal discharge and cough. Sacrificed. Passively motion unimpaired. Joint cavity contains no excess of fluid. There are no adhesions in the joint (Fig. 3). The joint surface of the patella is smooth. The denuded femur shows a even surface. Both bones are covered by a thin layer of translucent tissue. The fascia transplant has disappeared but for a small piece adherent to the joint capsule and patella tendon below the margin of the patella.

Microscopic examination. Sections were cut of the denuded femur and the lower margin of the patella including the remnant of the fascia transplant. The denuded femur is entirely covered by a thin layer of newly formed fibrous tissue growing from the narrow spaces. The most superficial cells are spindle-shaped and are arranged with their long axes parallel with the free surface. The free surface is made up of a thin layer of eosin staining material hyaline in character. There is no evidence of regeneration of the normal membrane (Fig. 3). There is no evidence of new bone formation and no sign of cartilage regeneration. The section taken for the study of the remnant of the fascia transplant passed through the lower margin of the patella, where the joint cartilage had not been entirely removed. The remnant of the transplanted fascia shows extensive degeneration. There are areas which show hyaline degeneration,



Fig. 3. Experiment No. 5. Free piece of fascia lata transplanted into joint twenty-eight days. The joint has been opened by lateral and medial longitudinal incisions. The quadriceps tendon, the patella and its tendon are turned down. A, denuded area on the femur; P, patella; T, remnant of the transplanted fascia.

and others showing a massive necrosis. The whole tissue is oedematous. (Fig 4.)

Experiment N 12 The same operative procedure was carried out as in Experiment N 8. The joint was fixed with plaster in a semiflexed attitude.

Seventh day Dog is in good condition. Plaster undisturbed.

Fifteenth day Plaster removed Healing per primam. The joint was not moved with plaster as reapplied.

Thirty-first day Animal found dead. Autopsy showed bilateral terine horn infection, puerperal in origin. Passive motion in joint is fairly good. Complete extension is not possible. On opening the joint, no excess of fluid is seen. Passing between the patella and denuded portion of the femur are two short, white, fibrous-like bands, roughly 3 mm. broad and 4 mm long. These bands are undisturbed remnants of the transplanted fascia. These bands certainly limit motion of the joint, and it is easily demonstrated that motion in either direction from the angle of fixation produces tension on these bands of tissue. The denuded bones were otherwise covered with this thin layer of translucent tissue. (Fig 5.)

Microscopical examination Microscopical sections were cut of the denuded femur so that the section passed through one of the bandlike adhesions between the femur and patella. The section shows the denuded cancellous bone to be covered over by a thin



Fig 4. Experiment N 18. Cross section of the lower margin of the patella with the remnant of the fascia transplant as shown in Fig 3. C, joint cartilage which was not removed from the margin of the patella. TT, fascia transplant showing hyaline degeneration at T and actual necrosis at T.

layer of fibrous tissue. Over a portion of the free surface there is a row of large pale cells, columnar and spindle-shaped and arranged similarly to columnar epithelium (see Fig 6). These cells were thought to be regenerating synovial endothelium. The band of tissue which united the femur and patella is composed of a rather cellular connective tissue. At the area of its insertion into the femur the fibrous bundles of the normal fascia persist. Other than this band of tissue, there is no evidence of the persistence of the transplant. Except for a few islands of new bone under the remaining joint cartilage on the lateral and medial sides of the condyles no new bone formation is seen.

SUMMARY

In experiment No 3 in which the local post-operative conditions were observed directly there was no discharge and very slight swelling. In experiments No 18 and No 12 the limb was put up in plaster of Paris dressing but there was no evidence of any greater local reaction. In experiment No 3 the free fascia transplant had entirely disappeared by the twenty-ninth day. In experiment No 18 there remained only a small portion after twenty two days which

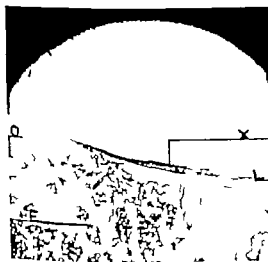


Fig 5. Experiment N 8. Cross section of the denuded femur shown in Fig 2. F, cancellous bone. C, joint cartilage which was not removed from the margin of the condyle. L, layer of fibrous tissue covering the bone surface. X, fibrous cradles.



Fig. 5. Experiment No. 2. Free piece of fascia lata transplanted into the knee joint thirty-one days. Not the small portion of the transplant (A) which has remained viable and has joined the denuded femur and patella.

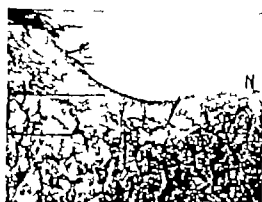


Fig. 6. Experiment No. 2. Cross section of the denuded area through the adhesions shown in Fig. 5. F cancellous bone from which the joint cartilage was removed, L, layer of new-formed fibrous tissue covering the spicules of bone; N, layer of columnar cells probably proliferating endothelial cells; A, persistent part of fascia transplant which formed an adhesion between the denuded joint surfaces.

showed microscopically evidence of rapid degeneration. In experiment No. 12 after thirty-one days the transplant persisted only in small islands which were attached to the joint surfaces, and which preserved the histological characteristics of fascia. In no instance did the entire transplant persist in the joint. This is contrary to its behavior when transplanted into soft parts, where it persists as has been demonstrated by Kirschner, Lewis, Davis, and others and as is shown in experiment No. 3. In experiment No. 12 the persisting islands of fascia had not covered the denuded bone as a joint surface but had rather assumed the characteristics of adhesions between the joint surfaces. The denuded bones had in each instance been covered over with newly formed connective tissue arising from the marrow spaces. In the two experiments in which the fascia transplant had entirely disappeared there were no adhesions between the denuded surfaces. A striking feature in each instance was the lack of new bone formation from the cancellous bone from which the cartilage had been removed. The slight new bone formation which was observed was under the cartilage which remained on the sides of the condyles.

III PEDICULATED FASCIA TRANSPLANTS

In this series of the experiments the operative procedure was in every way the same as in the free transplants except that the piece of fascia was left attached by a broad

pedicle. In the closure of the joint, great care was taken that the pedicle was not constricted. The fascia flap was dissected up, leaving the adherent fat. No attempt was made to include with the flap the subcutaneous fat.

Experiment No. 4. In this experiment the operative wound was dressed with collodion dressing, N plaster as used.

Second day. Very little swelling. N discharge.

Seventh day. Wound healed per primam. The dog puts the foot on the floor occasionally but does not use it in walking.

Tenth day. The animal does not use the leg.

Twenty-fifth day. The dog sits on the leg with limp.

Twenty-eighth day. Sacrificed. Passive motion of the joint good. There is some grating on motion. On opening the joint, there is slight excess of free fluid, slightly blood tinged. There are no adhesions between the patella and femur. The bones are, apparently entirely covered with thin, translucent layer of newly formed tissue. The fascia transplant has entirely disappeared, except for the pedicle which persists as a band running from the lateral condyle to the site of the incision of the joint capsule.

Microscopical examination. Sections of the denuded femur show the spicules of cancellous bone covered with a layer of newly formed connective tissue containing many blood vessels. The cells along the surface are elongated and arranged with their long axes



Fig. 7 Experiment No. 4. Transplantation of pedunculated flap of fascia lata into knee-joint twenty-seven days. F cancellous bone; X, small island of the transplanted fascia. Which has permeated, or possibly a piece of cartilage which has undergone fibrous change. Note that the newly formed layer of fibrous tissue (L) which has formed over the spicules of bone, also has grown over this island of tissue, illustrating the point that the free joint surface is formed by new fibrous tissue.

parallel to the surface. Lying over the spicules of bone near the middle of the denuded area there is a small island of tissue, which is evidently not newly formed tissue. This island is composed of strands and areas of a structureless hyaline like tissue which stains strongly with eosin. Scattered through this tissue there are elongated and triangular nuclei. Growing over the top of this island of tissue is a layer of newly formed connective tissue which is continuous with that covering the surrounding bone (Fig. 7.) Just what this tissue represents cannot be positively stated, but it seems most probable that it is a small island of the transplanted fascia. It may represent a small piece of cartilage which was left on the bone and which has undergone fibrous change and degeneration. The striking point, however, is the fact that in the healing process the newly formed connective tissue has covered it over so that it is entirely buried and does not form a part of the free surface. There is no new bone formation from the spicules of cancellous bone. At one margin of the denuded area under the cartilage there is a small amount of a typical bone formation.



Fig. 8 Experiment No. 3. Transplantation of pedunculated flap of fascia lata in the knee-joint forty-two days. The joint has been opened by median longitudinal incision and the patella tendon cut across. A, F denuded area on the femur; P, patella; T, tendon; Pd, persistent pedicle of the transplant extending from the site of the operative incision to the margin of the denuded area on the femur.

Experiment No. 3. The same operative procedure was carried out as in experiment No. 4. At the end of the operation the joint was slightly flexed and put in plaster of Paris.

Third day. Plaster in good condition. No swelling.

Sixteenth day. Plaster removed. Healing perfect. Plaster reapplied, without movement of the joint.

Twenty-third day. The animal has trouble with plaster bandage during the past two days. It walking the leg is occasionally used, but it is usually carried flexed.

Forty-third day. Animal does not use the leg in walking, but carries it slightly flexed. Passive motion seems good and there is apparently no slight tendency to resist passive motion. Sacrificed. On opening the joint there is no excess of free fluid. There are no adhesions between the denuded femur and patella. The denuded areas are covered over by this layer of newly formed fibrous tissue. The surfaces are quite smooth. The transplanted fascia remains only as a band between the lateral margin of the femur and the site of incision in the joint capsule (Fig. 8.) The remaining pedicle is a strong band .75 cm. in breadth, which looks quite like normal fascia lata. When the joint is held flexed



Fig. 9. Experiment No. 3. Section of the denuded area on the femur shown in Fig. 8. F cancellous bone; L, layer of newly formed fibrous tissue which covers the bone spicules except for the elevated area to the left of X. The pressure of the overlying patella must have been borne by this elevated area. The section is reproduced for the purpose of showing the necessity of keeping the joint surfaces free from pressure in order that the bare bone may be covered over by fibrous tissue.

at an angle of 90 degrees (about the angle at which the animal held the limb) the band is under no tension. Motion in either direction from this angle produces tension on the band.

Microscopical examination. Sections were cut of the patella, the denuded area of the femoral condyles and of the peristat pedicle of the transplant. The femur was found to be almost completely covered over by a thin layer of newly formed connective tissue. Along the free surface the cells are elongated and arranged in layers parallel with the surface. The superficial cells resemble very much endothelial cells. There is one small area in which the bone projects slightly above the surrounding bone and over this elevated portion there is no connective tissue covering the bone spicules being quite bare (Fig. 9).

Sections of the patella showed that the joint cartilage had not been entirely removed; a very thin layer had been left. There was no new bone formation to be seen anywhere. Sections of the remaining pedicle of the transplanted fascia showed it to be histologically the same as normal fascia lata. (Fig. 10.)

Experiment No. 3. The same operation as in experiment No. 4. The joint was not fixed.

Second day. Slight swelling. No discharge.

Sixth day. Wound healing per primam. Does not use the leg.



Fig. 10. Experiment No. 3. Section of the joint capsule from the site of operative incision showing the persistent pedicle of the fascia transplant shown in Fig. 8. S, silk suture; P, pedicle of the fascia transplant.

Tenth day. Wound healed. Animal does not use the leg at all; carries it flexed. Passive motion fair.

Twenty-second day. The animal was accidentally killed in a fight. Passive motion is unimpaired. There is some grating in the joint. On opening the joint there is an excess of free fluid. The patella and patella tendon are free. The only part of the transplant which remains is the pedicle which forms a band which extends from the upper margin of the denuded area on the femur to the site of the incision in the joint capsule. The silk sutures marking the original area covered by the fascia remain, but there is no evidence of growth of that part of the fascia flap which covered the denuded bone. The denuded femur and patella are covered by a thin layer of translucent newly formed tissue.

Microscopical examination. Sections of the denuded femur and patella and of the peristat fascial pedicle were prepared. The bones were found to be covered over by a layer of newly formed connective tissue. The cells were elongated and arranged parallel to the free surface. The most superficial cells in the areas strongly resembled endothelial cells. In no place was there any evidence of the persistence of the fascia transplant over the denuded bones (Fig. 11).

The bones showed no new formation where the joint cartilage had been removed. Near the margin of the femoral condyles the saw



Fig. 1. Experiment No. 8. Cross section of the denuded femoral condyles twenty-eight days after transplant of pedicled flap of fascia lata. C, cancellous bone; L, epiphyseal cartilage; B, layer of new-formed connective tissue covering the bone spicules.

had passed slightly into the epiphyseal cartilage. Here there was a small amount of newly formed bone. Also at one margin of the patella, where the saw had injured the junction of the patella and the patellar tendon, there was a small area of newly formed bone.

Sections of the remaining fascia pedicle show it to be composed of tissue histologically identical with normal fascia except that the fibrous bundles are irregular and tortuous. Attached to the remaining piece of fascia are numerous villous-like growths composed of new connective tissue cells and covered with cells which are apparently proliferating synovial membrane.

Experiment Y 25 The same operation was done as in experiment No. 3. The joint was fixed in plaster.

Fifteenth day. Master removed. Healing per os.

Thirtieth day. The animal is beginning to use the leg.

Fortieth day. Passive motion impaired completely. Extension not possible. The dog walks the leg with slight limp.

Sixtieth day. Animal is undead. Passive motion possible to complete flexion. Extension is limited about 4 degrees. Contour of the joint is normal. On opening the joint there is discharge of small amount of turbid mucinous fluid which is slightly blood-tinged. The patella is seen to be joined to the medial femoral condyle by a strong band of tissue opaque white color. The band measures 4-5 cm. in length and approximately 1 mm. in thickness. One end is inserted over the lower one third of the denuded area on the medial condyle. The other end is



Fig. 2. Experiment No. 25. Insertion of chromactrol plug (Bacter) under the rectus abdominis muscle twenty-seven days. O, cavity from which the membrane has been removed; M, rectus abdominis muscle. Note the extensive inflammatory reaction in the wall (W) of the cavity.

attached to the patellar tendon just below the lower margin of the patella. The length of the band permits complete flexion in the joint without marked tension. On extending the joint the band buckles up between the patella and the femur. There is another similar band which passes from the upper margin of the denuded area to the medial femoral condyle of the quadriceps tendon. This band measures 10 cm. in length, 1 cm. in breadth and approximately 1 mm. in thickness. One end is inserted on the upper part of the denuded medial femoral condyle at a distance of 1/4 cm. From this attachment the band passes anteriorly and downward to be attached to the quadriceps tendon and lateral capsule wall at a distance of 1 cm. The length of the band extending between the two structures to which it is attached measures about 15 cm. The position and the length of the free portion is such that complete flexion can be obtained without marked tension on the band. On extension, the band first relaxes and then is pulled taut at an angle about 30-40 degrees short of complete extension.

These bands of tissue replace the transplanted fascia which have so far appeared, taken root in the joint surface and are living fascia. That portion of the fascia transplant which lay over the lateral condyle has completely disappeared. The denuded bone is rough but is covered over by a layer of newly formed connective tissue. The pedicle of the transplant remains as a band passing from the lateral margin of the lateral condyle to the site of the incision in the joint capsule.

SUMMARY

In these experiments in which pedunculated fascia flaps were used that part of the transplant which was placed between denuded



Fig. 3 Experiment No. 2. Higher power view of all of the cavity shown in Fig. 2. C cavity. B growing blood vessel. Not the leucocytes and fibroblasts.

bones has acted identically as the free fascia transplants. In experiments Nos. 4, 8 and 13 this part of the transplant entirely disappeared. In experiment No. 25 the portion of the transplant which was interposed persisted in circumscribed areas as adhesions between the denuded surfaces.

In all cases the pedicle persisted within the joint as a band between the proximal margin of the denuded surface and the site of the operative incision in the joint capsule.

In each instance the denuded bones were covered over with a layer of newly formed connective tissue which arose from the marrow spaces. No new bone formation was observed.

IV CHROMACIZED PIG'S BLADDER (BAER)

Experiment V. The usual operation as performed. A piece of Baer's chromacized pig bladder was sutured to the joint capsule, so as to lie between the denuded femur and patella. Another piece about 1 cm. was inserted under the right rectus abdominis muscle. The joint was not put up in plaster.

Second day. Operative wound clean. Very little swelling. No discharge.

Third day. Knee joint is slightly swollen. There is very small amount of thin serous discharge from the abdominal wound.

Fourth day. The knee is more swollen than on the third day. There is sense of fluctuation. Pressure on the wound causes small amount of serous discharge. Abdominal wound swollen and discharging small amount of clear thin fluid.

Fifth day. Wounds not quite so swollen. No discharge from either.

Ninth day. Knee is again swollen and there is definite fluctuation. No discharge from abdominal wound.

Fourteenth day. Both operative wounds have healed. Not very much swelling. No discharge. Animal ill on the tenth day.

Twenty-eighth day. The animal was sacrificed. On opening the joint the inserted membrane as found slightly doubled up between the denuded bones. Except for being more friable the membrane appears as at the time of insertion. The denuded bones are covered with a layer of newly formed tissue. The abdominal wall was excised around the area of insertion of the membrane and hardened in formalin. On section, the inserted membrane was found lying free in cavity which contained cloudy fluid and the walls of which had the appearance of granulation tissue.

Microscopical examination. Sections of the denuded femur show that the cartilage was not entirely removed from the intercondylar groove. On the condyles, where the cartilage was completely removed, the spicules of bone are covered by a layer of newly formed fibrous tissue which is more abundant than that seen in experiments in which other substances had been used in the

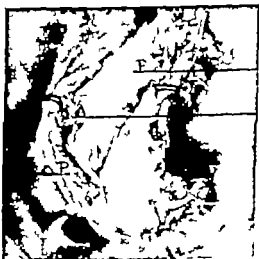


Fig. 14 Experiment No. 6. Inversion of Baer membrane in knee-joint forty days. The joint has been opened by longitudinal incision and the patella elevated. P, patella tendon; F, femur. Not the fibrous tissue (A) which binds the patella and quadriceps tendon to denuded area on the femur.

joint. Among the connective tissue cells are numerous fibroblasts and newly formed blood vessels. On the free surface there is a layer of fibrinous exudate. Near one margin of the denuded area there is a small island of newly formed bone.

Sections were prepared of the site of the insertion of the Baer membrane into the abdominal wall. The wall of the cavity containing the insert is made up of granulation tissue. There are many fibroblasts and leucocytes. The newly formed blood vessels extend almost to the margin of the cavity wall. There is no differentiation of the border cells. The cavity in every way is similar to an abscess cavity. On careful examination a few organisms were found. No organisms found in the knee joint section (Figs. 12 and 13).

Experiment V. The same operation was done as in experiment N. The joint as fixed in plaster in a slightly flexed attitude.

Fifth day. The plaster cast, which had become somewhat soiled, was removed. Wound had healed per primam. There had been no discharge. Not as mad as the amount of swelling. The joint as not moved. The plaster cast was reapplied.



Fig. 5. Experiment V. Cross section of the femur and quadriceps tendon shown in Fig. 14. F cancellous bone, A, fibrous tissue, back joins the denuded bone; the overlying patella and tendon. The patella does not show in the photograph but lies in the direction of the corner marked (X). S, small space lined with synovial endothelium. This space extends in for short distance from the margin of the femoral condyles.

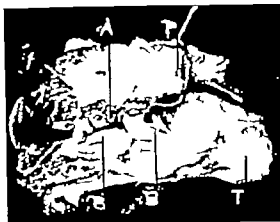


Fig. 6. Experiment N. Insertion of Baer membrane in the knee joint, seventy days. The joint has been opened by medial longitudinal incision. T, tibia, P, patella tendon cut across. BB masses of new-formed bone which have grown up from the margin of the femoral condyle. A, fibrous tissue adhesions between the denuded femur and overlying tendon and patella.

Thirtieth day. Animal is in good condition. Plaster cast undisturbed.

Fortieth day. The animal was sacrificed. The plaster cast was still in good shape. No functional test made. The operative wound had healed per primam. On passive movement flexion was limited. Extension was limited 40-45 degrees. On opening the joint, there was no excess of fluid. The inserted membrane had entirely disappeared. Between the upper half of the denuded area of the femur and the very big quadriceps tendon there was mass of dense fibrous tissue (Fig. 4). The remainder of the denuded femur is covered over with a layer of fibrous tissue, the surface of which is uneven. The patella is not adherent but in putting up the joint in a partially flexed position, part of the patella had come to lie over the end of the femur from which the cartilage had not been removed. The joint surface of the patella is covered with newly formed connective tissue.

Microscopical examination. Sections were cut of the denuded femur through the area over which the quadriceps tendon was adherent. The section shows the tendon bound down to the denuded bone by a mass of fibrous tissue which is relatively poor in blood vessels. Extending in from the lateral and median sides of the condyles there are two small slit-like spaces covered with endothelial cells, which have grown in from the walls of the joint capsule. From the spicules of the denuded bone there are a few small areas of new bone formation. Along the



Fig. 7. Experiment No. 6. Insertion of Baer membrane into the knee-joint sixty days. The joint has been opened by longitudinal incision. The photograph is superior anterior view. F femur; T quadriceps tendon. D area from which the cartilage was removed from the femoral condyles. A mass of fibrous tissue uniting the condyles to the overlying patella and quadriceps tendon.

lateral and medial sides of the condyles from which the cartilage was not removed there were under the remaining cartilage larger areas of newly formed bone (Fig 15).

Experiment No. 21 The same operation was done as in experiment No. 1. The joint is slightly flexed and put up in plaster.

Fifteenth day. The plaster was removed. The wound had healed per primam. There had been no discharge. The joint was not moved. Plaster cast left off.

Twenty days. Animal is in good condition. Does not use the leg. It is carried slightly flexed. Passive motion is apparently painful.

Thirtieth day. Passive motion is limited for complete extension and slightly for flexion.

Seventieth day. The animal is on the leg, but in doing so holds the knee fixed in slight flexion. Passive motion is possible through an angle of 60 degrees. Extension limited to 30 degrees. On palpation, the patella is only slightly movable. The quadriceps tendon is fixed. On opening the joint there is discharge of several drops of cloudy, milk-like fluid. The quadriceps tendon as far down as the upper margin of the patella is thickened. The denuded area of the femur is covered by numerous bands of fibrous tissue. This newly formed scar tissue covers the entire area denuded on the femur. The patella is free, but on putting the joint in the position of fixation the patella did not lie exactly over the denuded area on the femur. The joint surface of the patella is covered by a layer of newly formed connective tissue. Growing from the lateral and medial margins of the denuded area on the femoral



Fig. 18. Experiment No. 6. Cross section of the denuded femur shown in Fig. 7. The overlying patella and tendon have been cut away. F cancellous bone; C cartilage which was not removed from the lateral surface of the bone and which has undergone fibrous change. B, rim of new formed bone; A, fibrous tissue. Note the absence of bone formation from the spaces of cancellous bone.

condyles there are 4 ridges of newly formed bone approximately 3 cm. in height. This new bone formation has apparently been under the cartilage which was not removed from the sides of the condyles. (Fig. 6).

Experiment No. 6 The same operation as done as in the previous experiment. The operative wound as dressed in the collagen dressing. The joint was not fixed in plaster.

Fourth day. The knee is swollen and red. No discharge.

Seventh day. The joint is discharging thin, cloudy fluid.

Eighth day. The discharge continues. The animal does not use the leg.

Twenty-first day. The discharge has entirely ceased. The healing appears as though it had taken place per primam, as the discharge had always been from small sinus opening. The leg is carried with the knee slightly flexed. There is still some swelling and redness.

Thirty-seventh day. Wound healed. No discharge. Leg is not used. The knee is held fixed. There is no motion. Passive motion is limited to less than 30 degrees. The animal uses the joint is still reddened.

Sixtieth day. The animal sacrificed. The knee joint is flexed at right angle. It is practically immobile. On opening the joint the patella and the



Fig. 9. Experiment No. 1. Insertion of silver impregnated fascia under the rectus abdominall muscle thirty-seven days. M, rectus muscle; P, peritoneum; N, remnant of the inverted fascia. O, space left after absorption of part of the inverted fascia. Note the relatively narrow zone of inflammatory reaction in all (W) of the cavity.

tendon are completely adherent to the denuded ends of the femur by a mass of dense scar tissue (Fig. 7). The articular surfaces of the femur and tibia are quite smooth.

Microscopical examination. The patella and tendon were dissected from the femur by cutting through the mass of scar tissue. Microscopical sections were prepared of the denuded portion of the femur. The sections show the denuded cancellous bone spicules to be covered completely by dense fibrous tissue relatively poor in blood vessels. There is no new bone formation from the spicules of bone from which the joint cartilage had been removed. At the lateral and medial margins there are areas of new bone formation under the cartilage (Fig. 13).

SUMMARY

In these experiments with the interposition of chromadized pig's bladder (Baer membrane) a conspicuous feature was the marked local reaction about the joint. In experiment Nos. 2 and 6 in which the joint was directly observed after operation there was redness, swelling and discharge. In the two instances in which the experimental joint was fixed in plaster after operation (experiment Nos. 11 and 21) the amount of local redness and swelling was not observed. In these two instances there was no discharge. In experiment No. 2 in which the joint was

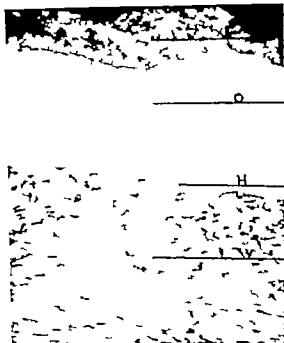


Fig. 10. Experiment No. 1. Higher power photograph of the wall of the cavity shown in Fig. 9. X, edge of the remnant of the impregnated fascia. O, cavity. W, cavity. All note the arrangement of the cells and absence of marked inflammatory reaction. Also the hyaline layer (H) along the margin.

was inserted into the soft part there was redness, swelling and a discharge. In experiment No. 2 the substance was present within the joint after 28 days. In experiment No. 11 it had been entirely absorbed at the end of 40 days.

The marked local reaction which followed the interposition of this substance was manifested by the presence of newly formed connective tissue greatly in excess of that seen in any other group of experiment. In those instances in which the substance had been absorbed this newly formed fibrous tissue had bound together the opposed joint surfaces.

In experiment No. 21 in addition to this fibrous ankylosis there was a marked new bone formation.

V. SILVER IMPREGNATED FASCIA

Fascia was impregnated with metallic silver for the purpose of producing a relatively non-irritative and absorbable substance. Fascia of dogs was used because an analogous method

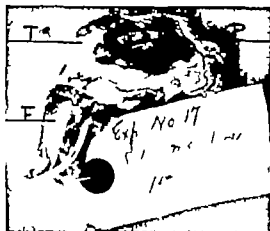


Fig. 5. Experiment No. 7. Insertion of silver-impregnated fascia into the knee-joint fifteen days. The joint has been opened by longitudinal incision, and the capsule turned over. F, femur; P, patella tendon; T, quadriceps tendon. Note the black silver-impregnated fascia which has partially disintegrated and is adherent to the femoral condyles and overlying patella and tendons.

which is quite as large as the inserted fascia. The walls of the cavity are composed of a thin layer of newly formed fibrous tissue. The cells of which are spindle-shaped and are of the type of the fully developed connective tissue cells. There are no fibroblasts and no new forming blood vessels. There are no leucocytes. A few groups of lymphoid phagocytic cells contain the black silver granules. The cavity shows no evidence of being filled



Fig. 6. Experiment No. 5. Insertion of silver-impregnated fascia into the knee-joint thirty-seven days. Cross section of the femoral condyles through the denuded area. F, new-formed fibrous tissue which covers over the bone spicules except for the elevated portion (B). See Fig. 5.

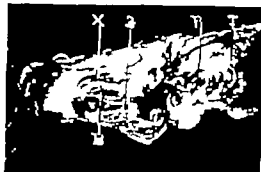


Fig. 27. Experiment No. 20. External destruction of joint surfaces. Insertion of silver-impregnated fascia thirty-five days. The joint has been opened by lateral and medial longitudinal incisions. The patella and tendons have been turned down. T, quadriceps tendon; P, patella. Note the smoothness of the joint surface of the femur (F) which has completely healed over with new-formed fibrous tissue except for the most prominent area (B), also the small tubercle of new-formed bone just above (X). There is also another small tubercle crowned by the line (F).

in by granulation tissue. The edge of the cavity is especially interesting. Along the margin the cells are very much elongated and show a striking resemblance to endothelial cells both in appearance and arrangement. Along the margin there is a thin hyalin-like substance which stains with eosin and contains only an occasional nucleus. (Figs. 19 and 20.)

Sections of the denuded femur and patella show a very striking picture in contrast to that seen in joints in which a more irritating substance has been placed. The ends of the bone spicules remain in a plane as left by the saw. Over their surface is a thin layer of newly formed connective tissue. The cells are elongated spindle cells, arranged with their long diameter parallel to the free surface. Along the free surface the cells show a differentiation in which they resemble very closely endothelial cells, and are usually covered by the thin, hyalin-like membrane seen in the cavity produced by insertion of the substance in soft parts. (Figs. 2 and 22.) There is no new bone formation and no regeneration of cartilage.

Experiment No. 1. Insertion of piece of silver-impregnated fascia after the usual denudation of the femur and patella. The joint was closed and put up in plaster in a semiflexed attitude.

Forty-four days. The animal has been in good condition. The plaster dressing has not been dis-

turbed. Animal sacrificed. Motion in the joint is good, except for complete extension. The limitation of extension of about 3 degrees is apparently due to contraction of the flexor muscles from the long period of fixation in plaster. The operative wound has healed per primam. The dressings show that there has been no discharge. On opening the joint, there is no excess of free fluid. The patella and the femur are seen to be joined together by a small band of newly formed fibrous tissue, about 2 mm. in width. The band passes from the middle of the patella to the central portion of the denuded area on the femur (Fig. 23). From the findings of experiment No. 1 it seemed possible that this adhesion could be explained by the supposition that the patella, as it were, wore a hole in the silver fascia before that active growth of granulation tissue had ceased. It is quite impossible to fix a dog's knee absolutely with plaster as the thigh muscles very quickly atrophy and loosen the plaster cast. Other wise the joint is free of adhesions. The denuded bones are covered with a thin layer of newly formed tissue, the free surface of which is quite smooth and glistening. Except for slight pigmentation, there is no trace of the inserted fascia.

Microscopic examination. Sections of the denuded bones show them to be covered entirely by a layer of newly formed connective tissue. Along the free surface there is a very thin layer of a hyaline like material. The connective tissue cells below are spindle shaped and are arranged parallel to the free surface. There is no evidence of new bone formation nor of regeneration of cartilage. The section was taken through the adhesion between the patella and the femur. The band is composed of newly formed fibrous tissue. Except for a few islands of pigmented cells there is no evidence of the fascia insert. (Fig. 24.)

Experiment No. 17. Same operative procedure carried out as in experiment No. 1. Joint was fixed in plaster at the end of the operation.

Second day. The foot was considerably swollen. The plaster had evidently been put on too tight about the ankle. Plaster cast was split at short distance.

Seventh day. Swelling of foot quickly subsided. The animal is in good condition.

Tenth day. Animal has distemper. Plaster is solid, but wound looks clean.

Fourteenth day. The animal is quite sick. Profuse nasal discharge. Sacrificed. The joint also has no limitation of motion. The operative wound has healed per primam. On opening the joint there is a discharge of a small quantity of cloudy fluid, slightly blood-tinged (probably from manipulation). The patella is quite free from the femur. There are

no adhesions in the joint. The patella surface is smooth. The denuded area on the femur is covered entirely by the inserted silver fascia. The insert remains as slightly gelatinous, friable, black mass. (Fig. 5.) In some areas this is easily removed with forceps, and in other areas it is quite firmly adherent to the denuded bone. Under the insert the bone is covered by a thin layer of granulation tissue.

Experiment No. 15. The same operation was done as in experiment No. 10. The joint was fixed in plaster.

Eighteenth day. The animal is in good condition. Plaster dressing undisturbed.

Thirtieth day. Dog has distemper. Wound is healed. Plaster unchanged.

Thirty-seventh day. Animal found dead. After removal of plaster the joint was found freely movable, no limitation. On opening the joint, there was no excess of fluid. The patella and tendon were quite free from the denuded femur, except for a small threadlike adhesion extending from the superior margin of the denuded area of the femur to the quadriceps tendon just above the superior margin of the patella. The denuded bones were covered over by a thin layer of newly formed tissue, slightly stained from the black particles of silver. The inserted fascia had entirely disappeared.

Microscopic examination. Section of the femur shows the denuded area to be covered over with a relatively thin layer of newly formed connective tissue with the exception of one edge of the bone which is higher than the surrounding bone and on which probably the patella rested. This margin shows the bone quite bare. The appearance and arrangement of the connective tissue cells are similar in every respect to that seen in experiment No. 10 (Fig. 26). There is no newly formed bone and no regeneration of cartilage.

Experiment No. 19. In this experiment the usual lateral incision into the joint capsule was extended upward into the quadriceps muscle, thus permitting the patella to be more completely dislocated medially. After the dislocation of the patella, the joint was sharply flexed and the anterior cruciate ligament cut. This permitted a very good exposure of the tire joint. With sharp curet every bit of joint cartilage which could be reached was removed from the patella, the femur and the articular surface of the tibia. A large piece of silver impregnated fascia was then placed over the femur. The lower edge of the insert was pulled between the femur and tibia by sutures passing through the posterior wall of the joint capsule. After closure of the joint it was slightly flexed and put up in plaster.

Third day. Dog is in good condition. Plaster was not removed, but there was no marked swelling of the leg.



Fig. Experiment No. 1. Insertion of silver impregnated fascia into the knee joint fifteen days. Cross section of the denuded femur. A cancellous bone; C cartilage. B is not removed from the sides of the condyles. L, layer of new-formed fibrous tissue over the bone spicules. Not the thickness of the layer of fibrous tissue covering the denuded bone and the presence of new bone formation from the spicules of cancellous bone.

of preparation and insertion may be used in the human. Silver was added because of its recognized non-irritative properties when embedded in living tissue. Metallic silver is also credited with antiseptic action.

The preparation of this substance was not a complicated process, the steps being the fixation and saturation of the fascia with a soluble silver salt and precipitating metallic silver *in situ* by a reducing agent. The excised fascia was spread out on a glass slide and dropped into to 10 per cent aqueous solution of silver nitrate. The container was placed in such a position that it was exposed as much as possible to the direct sunlight and allowed to stand for 72 hours. At the end of this time the piece of fascia was dark brown in color. It was then taken out of the solution, rinsed quickly in distilled water and dropped into a generous quantity of 0 per cent aqueous solution of pyrogallie acid. The fascia immediately became jet black. It was left in the reducing solution 20 minutes and then washed in running water 24 hours. Fascia put through this process is jet black in color, soft pliable and apparently quite as strong as when freshly excised.

For sterilization three methods were used. At first no attempt was made to keep the fascia surgically clean. After preparation it was placed between boards dried at 40 de-

grees centigrade and then sterilized 20 minutes in the ordinary steam sterilizer at 15 pounds pressure. This caused the fascia to shrink to almost $\frac{3}{5}$ to $\frac{2}{3}$ of its original size and when removed from its wrapping it was quite hard and brittle. After soaking a few minutes in warm water it became quite pliable again, but a great deal of its strength was gone so that sutures pulled through very easily. Later the piece of fascia was kept relatively clean and after impregnating it with silver it was soaked in bichloride of mercury solution after which it was placed in 80 per cent alcohol until used. Finally the fascia was kept surgically clean throughout the whole course of its preparation; that is, it was taken out with aseptic precautions. The solutions of silver nitrate and pyrogallie acid were sterilized and the fascia handled with sterile instruments, washed with sterile water and finally placed in 80 per cent alcohol until used.

Experiment 1: The right knee joint was opened in the usual manner and a piece of the silver impregnated fascia was placed in the joint between the patella and femur without any injury to the joint surfaces being done. The insert was held in position with silk sutures. Another piece was placed in the abdominal wall, under the right rectus muscle. Both operative wounds were dressed with collodion dressing.

Seventh day. Both wounds have healed perfectly with very slight amount of local reaction. discharge.



Fig. Experiment No. 1. Higher power photograph of the edge of the section shown in Fig. 1. A, cancellous bone; M, marrow space; L, new-formed fibrous tissue covering the denuded bone. Not the character and arrangement of the silver.

Tenth day Dog is walking on leg with only a slight limp.

Fifty-second day Operative wounds have completely healed. The animal uses the knee just as on the unoperated side. The animal was anasthetized again and the left knee opened in the usual manner. The joint surface of the patella and anterior portion of the femoral condyles were sawed off and a piece of silver fascia placed between the denuded bones. Another piece was inserted under the left rectus abdominalis muscle. Wounds were dressed with collodion. No plaster used.

Thirty-seventh day All operative wounds healed per primam with very little local reaction and no discharge. The animal walks on the leg operated first with no limp. On the side operated on last there is a slight lump. The animal was sacrificed.

Left knee (15 days) Passive motion unimpaired. On opening the joint, there is a discharge of a few drops of brownish fluid. The patella and tendons are not adherent to the femur. The inserted silver fascia is seen lying over the denuded femur. The stay sutures are in place the insert has disappeared completely over a small area in the center. The movement of the patella has apparently worn the fascia away at this point. Over the remaining denuded femur the silver membrane remains as soft slightly gelatinous, black covering, which can be picked off in flakes. After washing the material off the denuded femur is found to be covered by thin layer of translucent tissue which feels smooth. The joint surface of the patella is similar in appearance.

Right knee (37 days) There was no impairment of motion in the joint. On opening the joint,



Fig. 24. Experiment No. 2. Cross section of the femur through site of the adhesion shown in Fig. 3. F cancellous bone. E, epiphyseal cartilage. L, layer of new-formed fibrous tissue. The superficial layer has been torn away at the left of the figure in the preparation of the specimen. A, adhesion between the femur and patella.

except for a slight brownish pigmentation of the joint surfaces, the joint appeared quite normal. The inserted membrane had entirely disappeared. Only the stay sutures remained, making the site of insertion.

Insertions The abdominal wall The sites of insertion were excised en bloc fixed, and microscopic sections prepared. Sections were also cut of the denuded bones in the left knee joint.

Microscopical examination Sections of insert at the end of 15 days under the rectus muscle show that the membrane has rolled up into a mass about $\frac{1}{8}$ cm. in diameter. (Note the membrane was simply laid in the wound no anchoring sutures being used.) The insert looks about the same thickness as when inserted. The area of reaction around the foreign substance is strikingly small. Around the insert there are numerous phagocytic cells filled with black granules. The connective tissue cells forming the cavity wall are spindle-shaped and are arranged parallel to the free edge. Along the edge there is a thin layer of hyalin like tissue. The differentiation of the cavity lining is even more striking in the older insert and will be described with it.

Sections taken of the abdominal wall insert of thirty-seven days show the substance has disappeared but for a very small piece. This small remnant lies free in a slit like cavity



Fig. 3. Experiment No. 1. Insertion of silver compressed fascia into the knee joint forty days. The joint has been opened by a medial longitudinal incision and the capsule turned over. F, femur. P, patella tendon. A, small blackish adhesion between the patella and middle of the denuded area on the femoral condyles.

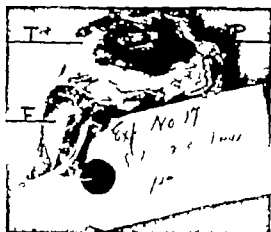


Fig. 5. Experiment No. 7. Insetion of silver impregnated fascia into the knee-joint fifteen days. The joint has been opened by longitudinal incision and the capsule turned over. F (fascia); P, patella tendon; T, quadriceps tendon. Note the black silver impregnated fascia which has partially disintegrated and is adherent to the femoral condyles and overlying patella and tendons.

which is quite as large as the inserted fascia. The walls of the cavity are composed of a thin layer of newly formed fibrous tissue the cells of which are spindle-shaped and are of the type of the fully developed connective tissue cells. There are no fibroblasts and no new forming blood vessels. There are no leucocytes. A few groups of lymphoid phagocytic cells contain the black silver granules. The cavity shows no evidence of being filled



Fig. 16. Experiment No. 8. Insetion of silver impregnated fascia into the knee-joint thirty seven days. Cross section of the femoral condyles through the denuded area. F cancellous bone; L, new-formed fibrous tissue which covers over the bone spicules except for the elevated portion (B). See Fig. 9.



Fig. 7. Joint surface thirty five medial for has been. Note the black in tissue on small is also as.

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6 The more irritating chromadized pig's bladder membrane always led to a much greater amount of fibrous tissue formation and the fibrous tissue formed in every instance more or less completely united the opposed joint surfaces.

7 The relatively small amount of new bone formation from the ends of the bones in the joint makes the prevention of union between raw joint surfaces a problem which is identical with that of cavity production in soft parts. With the transplantation of living tissue into soft parts, in case the transplant preserves its vitality it heals in the tissues without cavity formation. If the insert undergoes necrosis and absorption or is an absorbable, non-living substance which excites very little inflammatory reaction, it disappears, leaving a cavity. If the insert is of such a nature as to set up a

marked inflammatory reaction, the tendency of the process is to close the cavity occupied by the insert in a manner similar to the closing of an abscess cavity.

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THE END RESULTS OF ATTEMPTS TO MOBILIZE STIFFENED JOINTS

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THIS report is made with some reluctance because in the majority of cases the results of the attempts at the mobilization of stiffened joint which have been made by the writer have been far from satisfactory. At the outset it must be understood that no criticism is intended of the work of other men who have been more successful in their attempts. Rather are these happy results evidence of greater skill. If the honesty of endeavor need not be questioned it seems fair to report a small series of cases which may be classed as failures in the hands of one who has been fortunate enough to have had an ample surgical training lacking though he may be in technique.

One of the maxims of surgery must be still *Primum non nocere*. The report of failures which have resulted from at least considerate attempts may add good judgment.

In a recent number of the Journal of the American Medical Association will be found the report of a paper read before a prominent state medical society on "Post Rheumatic Ankylosis." The writer of this paper is reported to have said: "In aggravated cases of post rheumatic ankylosis in which there is osseous union it becomes necessary to resort to arthroplastic operations. When an arthroplastic operation is correctly performed in a suitable case and the proper after treatment is carried out there is a reasonable assurance that the patient will have a freely movable joint free from pain and which will support weight and withstand traction." Large loopholes are left in this statement by the limiting phrases "correctly performed" and "suitable case" but in spite of these, there can be no doubt as to the impression given that arthroplasty is no longer in the experimental stage but that on the other hand all the different joints may be subjected to this operation by any good surgeon and that "there is a reasonable assurance that the patient will have a freely movable joint free

from pain and which will support weight. The author may not have been correctly reported but such a report in our opinion may be productive of much harmful surgery. By personal observation and personal conversation we have tried to obtain a fair idea of the results at present to be expected in the hands of the most experienced and skillful advocates of these operations, and no such rosy prognosis is warrantable. The extreme of optimism is represented by the attitude of J. B. Murphy and the extreme of conservatism by Lorenz.

In no way do we wish to be understood as discouraging further attempts. We still possess enthusiasm for perfecting technique and appreciate the great advances which have been made. We are inclined to believe however in the light of such a series as those reported which we believe may be duplicated in the hands of other surgeons, that unilateral, painless, bony ankylosis of the knee hip shoulder and possibly elbow should be submitted to arthroplastic operations at the present stage of our technique only after a free discussion with the patient and a realization on his part of the prolonged and often painful after treatment and the somewhat uncertain nature of the results. We urge as far as possible the concentration of these cases in the hands of a few men preferably only one in a city who will fit himself by study to be at least conversant with the most successful methods. The mobilization of stiffened joints peculiarly concerns orthopedic surgeons, and the profession has a right to expect most careful consideration by them of a matter so important.

For the history of attempts at the mobilization of stiffened joints the reader is referred to excellent articles by PAYR, BAER, MURPHY, NEFF, R. T. TAUBER and others.

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3739, 3740, 3741, 3742, 3743, 3744, 3745, 3746, 3747, 3748, 3749, 3750, 3751, 3752, 3753, 3754, 3755, 3756, 3757, 3758, 3759, 3760, 3761, 3762, 3763, 3764,

OUTLINE AND RESULTS OF SIXTEEN ARTHROPLASTIC OPERATIONS

HIPS

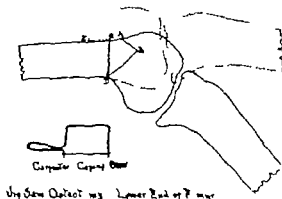
Case No.	Age	Type of Ankylosis	Cause and Duration of Ankylosis	Date and Type of Operation	RESULTS		
					Time elapsing operation	Motion P—Passive A—Active	Stability and Function
A. J.	42 M.	Bony	Infectious arthritis 3 years	999 Excision. Flap of capsule. Two-chamber arthroplasty.	years	P—90° A—about same	Good.
J. D.	41 M.	Bony	Post-operative Old Pott's year	999. Devison bony bridge. Flap of tissue. Ant. incision.	years	P—90° A—90°-90°	Fair.
P. C.	41 M.	Bony	Infectious arthritis year	91 Lateral incision. Excision after fracture of neck.			Death from shock and stasis. Lymphatic.
L. H.	41 F.	Fibrous	Infectious arthritis years	191 Ant. incision. Desartroplasty. Reshaping of head. Free fascia flaps	11 months	P—90° A—90°-90°	Good. Disabled after three months; reduced. No tenderness.
P. D.	41 M.	Fibrous	Hypertrophic arthritis 3 years	999. Ant. incision. Partial excision (Chase)	months	P—90° A—90°	Fair and improvement

KNEES

E. D.	41 M.	Bony	Excision of knee year Old pulmonary tuberculosis	Feb. 1, 909. U-shaped incision. Reshaping each knee's membrane. Sept. 1, 1900. Soft ligaments	3 years	P—90° A—Same	Fair with splint.
M. L.	41 F.	Fibrous	Infectious arthritis 10 months	Sept. 1, 909 Lateral incision. Devison of soft tissues. Bone's membrane. May 1, 1910 Injection of oil. July 1, 1910 Post. incision. Space removed.	years	P—90°-115° A—10°-115°	Good with splint.
H. H.	41 M.	Bony	Infectious arthritis 8 years	May 1909. U-shaped incision. Bone ends shaped. Bone's membrane	years	P—None A—None	Good. Stiff.
D.	41 F.	Bony	Infectious arthritis (O) Few months	Sept. 91 Lateral incision. Adhesions separated. Dec. 1909 Lateral incision. Free fascia bony's partial.	year	P—Few° A—Few° P—Few° A—Few°	Fair.
L. H.	41 F.	Fibrous	Infectious arthritis 3 months	91 Lateral incision. Adhesions separated. Free fascia flaps	year	P—90°-100° A—90°-100°	Fair with splint.
B.	41 F.	Fibrous	Infectious arthritis year	91 Lateral incision. Bone's membrane	year	P—C° A—Same	Good.

ELBOWS AND JAW

C. H.	41 M.	Bony	Old fracture 6 years	999 Post. incision. Gag in shaping. Bone's membrane	years	P—100° A—90°	Fair—G, Good—P
M. L.	41 M.	Bony	Hypertrophic arthritis months	999 Post. incision. Gag now shaping. Bone's membrane	year	P—None A—None	Good. Stiff.
D. C.	41 M.	Bony	Old wrist? Tuberculous lesion?	999 Post. incision. Gag now shaping. Free fascia flaps	years	P—90° A—10°	Good.
L. H.	41 F.	Bony	Infectious arthritis (O) years	91 Post. incision. Shaping of bones. Free fascia flaps	6 months	P—90° A—90°	Fair.
A. B.	41 F.	Bony	Infectious arthritis years	999 Excision of condyle. Bone's membrane	years	P and A N. in. separation	Good.



the operation and often persisting for months. In three cases the membrane itself in whole or in part, has been extruded several weeks after the operation but that has not seemed to interfere with persisting mobility. In the cases where free fascia flaps have been used, the healing has been by first intention, and no sinuses have occurred except in the one case of a tuberculosis developing in the operated elbow six months after the arthroplastic operation. Although generous portions of fascia lata have been excised (four inches square) there has been no subsequent muscle hernia or any evident weakness.

The charts will outline quickly the scope of the operations. I have included two private cases of Dr. J. E. Goldthwait's in which the unsuccessful operation was performed by the writer at his request, two cases of Dr. E. G. Brackett's, and one case of Dr. C. F. Painter's, operated on by them. My thanks are extended to these three surgeons for their permission to report their cases. Detailed reports of the cases are not necessary in such a communication as this. The important points and the types may be gathered from the appended charts.

We have used to prevent ankylosis recurring, either chromicized pig's bladder as recommended by Baer or pieces of free fascia removed from the fascia lata at the time of operation. In two of the hip cases we have turned in pedunculated flaps of tissue. In only one case has any considerable inflammatory reaction followed the use of the pig's bladder membrane but in every case there has been a slight discharging sinus, some times coming on as late as three weeks after

We realize how inconclusive these unsatisfactory results are. That the technique was faulty in many of the cases is at once apparent. We are aware at present of many details which might change the outcome. Yet I confess the end results of some of the cases have given me pause. When we obtain a joint with useful motion persisting for six months and then gradually see this motion disappear in spite of careful after treatment, owing to joint sensitiveness and to soft part contractures, and when we may watch the overgrowth of bone about our seat of operation continue for long periods, we owe it to our patients to explain these possible contingencies until we know how to surely prevent them. Payr has wisely said that we must carefully select our cases both in relation to occupation, social status, and temperament, before we attempt by the methods now advocated to mobilize stiffened joints, and the writer would add that in addition to this selection our prognosis should be most guarded as to painless or useful motion and as to function.

CHOLECYSTECTOMY¹

By JOHN B. DEAVER, M. D. Sc. D. LL. D. PHILADELPHIA

WHEN we consider the great surgical importance of the gall bladder the extraordinary variability of its pathology the severity and deadly nature of the diseases which affect it directly and through it indirectly involve the neighboring organs, the mortality which still clings to both medical and surgical treatment, and finally the lack of accord among experienced surgeons concerning those procedures best suited for the treatment of certain most serious aspects of gall bladder disease it is evident that the subject of cholecystectomy is not one to be lightly considered or easily decided. We who practice surgery must act, whether we wish it or not, as judges in a capital case upon which not only one but many lives depend.

In certain well defined conditions there is practical unanimity concerning the advisability of removing the gall bladder. These are

1. Hydrops with obliteration of the cystic duct.
2. Chronic empyema.
3. Calcareous degeneration.
4. The cholesterol gall bladder of Moynihan.
5. Gangrene.
6. Carcinoma limited to the gall-bladder.
7. Extensive laceration or perforation of the gall-bladder.

These conditions possess in common these two undesirable features (1) the impossibility of *restitutio ad integrum* and (2) the certainty or probability of a progress of the disease. There is but little chance for division of opinion in the presence of plain indications such as these. Yet a word of caution here is not unnecessary. The patient and surrounding conditions must be considered as well as the lesion. As Lillenthal has well said, "Anyone can learn to work according to set rules, but only an artist knows when to disregard them." I have, on more than one occasion, been content simply to drain a gangrenous gall bladder and have

seen the patients recover without the necessity for a second operation. These were cases often desperately sick, in whom I found that the omentum had preceded me to the seat of the trouble and wrapping itself about the gangrenous area had effectually excluded it from the general abdominal cavity. To break up these protecting adhesions and inflict upon the acutely inflamed area the trauma necessary to the removal of the gall bladder would be to invite catastrophe. Under these circumstances it is better to accept the chance of being obliged to do a second operation, for surely a living patient after two operations is better than a dead patient how ever beautifully and thoroughly operated.

With this provision we may accept as absolute indications for cholecystectomy the conditions already enumerated. But the majority of cases that come to operation today show no such advanced pathology. What is to be our attitude toward the lesser grades of acute and chronic cholecystitis with or without stones toward the cystic gall-bladder when from the appearance and the condition found it is quite apparent that the occlusion of the cystic duct is of recent date toward the cases of localized gangrene of the fundus of the gall-bladder toward cases of small perforations or wounds and finally and of special importance what shall we do in the presence of pancreatic involvement or peripancreatic retroperitoneal lymphangitis and lymphadenitis?

In such cases the question of cholecystotomy or cholecystectomy must be met and decided by the surgeon. The operation of cholecystotomy which consists in simple incision of the gall bladder removal of the calculi, and closure without drainage is the classical operation for gall bladder cholelithiasis and though formerly often performed with good results it has been almost discarded of late years owing to the appreciation of the need for drainage in clearing the gall bladder

and biliary passages of the infection, of which the calculi themselves are but a result. Kocher has never quite abandoned cholecystotomy and recently a few prominent surgeons have shown a tendency to employ the operation in selected cases. If the recent ideas of Aschoff and Basmester are correct as to the possibility of the pure cholesterol stone being formed in the gall-bladder as a result simply of stagnation and altered metabolism without the presence of infection, this simple operation would seem not only proper but preferable since the likelihood of post-operative adhesions would be much reduced. On the other hand such simple conditions come very rarely to operation. When the calculi are the result of catarrhal inflammation of the gall-bladder due to the presence of bacteria, drainage is decidedly indicated. It is true that infections of the gall-bladder die out in a percentage of cases and at the time of operation no organism can be obtained by culture in about fifty per cent of the cases. Yet there can be no doubt that in some instances organisms may be lurking in the crypts and folds of the mucosa of the gall-bladder when they are not demonstrated by cultures of the bile. Moreover it is not usually possible to determine at the time of operation whether active infection is or is not present. Therefore I feel that the patient's welfare will be best guarded by the institution of drainage in all such cases, since this can do little if any harm, while the failure to drain may permit the infection to resume its activities unchecked. Granting, then, the applicability of simple cholecystotomy in cases properly selected, it is nevertheless true from a practical standpoint that the surgeon will very seldom be able to select such cases, and as a rule some operation involving either drainage or removal of the gall-bladder must be employed if we wish to do the greatest good to the greatest number.

To remove or not to remove the gall-bladder is the question that makes Hamlets of us all. The conservative section holds to cholecystotomy in all conditions other than those enumerated as the absolute indications for cholecystectomy. Those who take this stand do so because they believe that the function

of the gall-bladder is a beneficial one and should be preserved whenever possible that the effects of drainage are as truly curative as the more radical operation, that the lesser operation has a well defined lower mortality than the more radical that post-operative complications and remote effects are less dangerous and troublesome after simple drainage than after removal, and that in the event of a later operation being required the presence of the gall-bladder and the absence of the dense adhesions which often follow cholecystectomy render the surgery of the biliary passages easier and less dangerous.

On the other hand, those who would extend the field of cholecystectomy argue that the gall bladder is a vestigial and unnecessary organ that permanent cure is not assured by drainage that reinfection occurs not infrequently requiring re-operation or re-establishing invalidism on the part of the patient that, granting the truth of increased difficulty of a secondary operation after removal of the gall-bladder the chance of such an operation being necessary is much diminished, and finally that the slightly increased primary mortality of cholecystectomy is more than compensated in the long run by improved results.

The precise function of the gall-bladder is, like that of the appendix, not definitely settled. The structure and apparent function of the appendix, however, suggests that its activities do not differ materially from that of the large intestine adjacent to it. For this reason the loss of its function to the body is of no moment. The gall-bladder however is a highly differentiated portion of the biliary tract and we cannot so reasonably expect complete compensation for its loss if we conceive of its function as being one of importance. The old idea of the physiologists that the gall-bladder served as a reservoir for bile during the period when it was not needed for digestion is quite inadequate considering the small size and moderate distensibility of the gall-bladder together with the fact that the average daily output of bile in the adult is from 30 to 50 ounces. Moreover the muscular coats of the gall bladder are not capable of expelling its contents completely which further detracts from its value as a storage

organ. That the bile does back up in the gall-bladder during the intervals between digestion is certain as is shown by the increased drainage from a cholecystostomy opening during the night. Nocturnal pain in cholecystitis may also be explained in this way the gall-bladder being distended by the back flow and in its inflamed condition giving rise to pain. The suggestion that it acts as a tension bulb has much to commend it. During the fluctuations in pressure within the ducts which probably occur as a normal consequence of digestion and the influences which increase or diminish the secretory activity of the liver cells as well as those fluctuations in pressure which undoubtedly result from pathological causes, the existence of such a diverticulum from the duct tract undoubtedly spares the parenchyma of the liver from back pressure in many instances. Observations by surgeons of dilatation of the common bile duct after cholecystectomy would seem to support this view and it has even been observed that a diverticulum has formed from the cystic duct after the gall-bladder had been removed. The mucus found in the gall bladder is believed also to have a beneficial effect in diluting the bile and rendering it less harmful in the event of its retrojection into the pancreatic duct. Whether or not our ideas concerning it be right, it seems to me that the evidence favors the belief that the gall bladder has a desirable function, even though the fact that its presence is not necessary to good health cannot be gainsaid. We must remember however that its functions must be very materially altered by inflammation which thickens and contracts its walls and changes the character of its secretions.

Much hinges upon the curative value of cholecystostomy in gall-bladder infections. There can be no doubt that the complete rest thereby afforded to the gall-bladder walls as well as the drainage of the bile from the natural passages does cause subsidence of the infection. It does not however restore, nor can it be expected to restore the organ to a normal condition. If any extensive inflammatory alterations have taken place the scars must remain not only as mute evidence

of the previous infection but as a point of diminished resistance in the future. Still it is surprising in how many cases permanent cure results. The reformation of gall-stones after cholecystostomy is a very rare occurrence. I have observed one instance in which I operated and removed 100 gall-stones. Two years later a second operation was done and 200 gall-stones removed. It is not very uncommon to leave stones behind but I flatter myself that I could scarcely have overlooked this number. Yet this may have been an example of the cholesterol gall-bladder of Moynihan, also called the strawberry gall bladder by MacCarty. In this condition which I had observed and mentioned prior to either of the above gentlemen, we find small gall-stones or particles of cholesterol embedded in the mucosa of the gall bladder. These cannot be scraped out nor disposed of by drainage so that the presence of this condition is now recognized as a sufficient cause for cholecystectomy.

Mayo has observed five cases in which there was every reason to believe that stones had reformed in the common duct. We must, therefore admit the possibility of recurrence of gall-stones after operation a chance the danger of which is greatly diminished by removal of the gall-bladder.

Pancreatic and peripancreatic inflammation when associated with gall-bladder disease should influence our treatment of the gall-bladder itself. We (Dr D B Pfeiffer and myself) have in another paper pointed out the method by which infection is carried from an inflamed gall-bladder to the peripancreatic tissues and we believe that in a percentage of cases the pancreas may be secondarily infected in this manner. The lymphatics of the gall bladder are collected into trunks which travel along the cystic duct to the right free border of the gastro-hepatic omentum following the course of the common duct. Some of these trunks are interrupted in their course by lymph nodes, one of which is found quite constantly at the neck of the gall-bladder another at the junction of the supraduodenal with the retroduodenal portion of the common duct. Occasionally still others are met with. Some of the trunks are

not thus interrupted but pass together with the efferent lymphatics from the glands just mentioned to the cellular tissues and glands immediately in relation with the pancreas. As regional glands of the pancreas Bartel describes the pancreatico-splenic and superior pancreatic, the superior gastric, hepatic, pancreatico-duodenal (anterior and posterior) mesenteric, mesocolic, inferior pancreatic and peri-aortic. These groups will be found pictured and described more fully in an article by Deaver and Pfeiffer.¹

To all these groups of glands the pancreas sends lymphatic branches which may anastomose in the cellular retroperitoneal tissues with the lymphatics from the stomach, duodenum, spleen liver gall-bladder and bile ducts, the colon, and even the left supra-renal. Probably still other intercommunications exist which were not demonstrated. I have seen retroperitoneal lymphatic infection in this situation which was undoubtedly of appendicular origin. Only when the intercommunications of the pancreatic lymphatics with those of the adjacent organs are most intimate, short in their course and unprotected by intervening lymphatic nodes does peril commonly arise of lymphangitis being communicated to the pancreas itself. This most intimate relation Bartel has shown to exist with the lymphatics of the adjacent duodenum, and more recently Franke has shown that the same is true of the lymphatics coming from the gall-bladder. The lymphatics arising from these sources are in many instances closely applied to the surface of the head of the pancreas and inoculate directly with the efferent lymphatics from that organ. The inflammation of the head of the pancreas which we see so commonly in gall-bladder inflammation corresponds in extent to the lymphatic distribution and not at all to the duct distribution as would naturally be the case were the infection the result of ascending duct infection.

For some time I have been observing these peripancreatic lymph nodes in the course of my upper abdominal explorations and I find them almost invariably enlarged in gall-bladder infections. This is a condition in

every way comparable to enlargement of the cervical glands associated with tonsillitis. When the source of infection is removed the lymphatic damage also recovers. Absorption of bacterial toxins from the gall-bladder occurs chiefly in this way and the serious effects of this absorption are a well-known clinical fact. Babcock has pointed out the rôle of cholecystitis in the causation of myocardial degeneration but the other organs suffer as well. Arterial, renal and other serious toxic effects may follow the same cause. When, in my opinion, such a condition is present and the gall bladder presents such serious alterations as to make the question of cure by cholecystostomy problematical, I do not hesitate to perform cholecystectomy. This aspect of the question must be thoroughly understood. I am not advocating cholecystectomy in all cases of peripancreatic or pancreatic inflammations. Not all cases of pancreatitis arise in this manner. When the pancreas appears markedly or chiefly affected I would hesitate to remove the gall-bladder because of the possibility that it may be needed at a later period owing to the progression of the pancreatic lesion and obstruction of the common duct thereby. In the event of such a complication the safest and best operation would be cholecystoduodenostomy the condition of the gall-bladder warranting. The operations devised for transplantation or reconstruction of the common duct are ingenious and may serve in desperate straits, but I would not willingly put myself in the position of being obliged to rely upon them.

The higher mortality of cholecystectomy as opposed to cholecystostomy is one of the strongest objections to the extension of cholecystectomy into fields where it is not positively required. Yet we should not be misled by the published figures of the relative mortality of these two operations. Most surgeons admit from two to five times as high a mortality in removal of the gall-bladder as in drainage. It must be remembered, however that cholecystectomy has been reserved by most surgeons for the more severe and complicated cases in which the mortality is necessarily high from the severity of the disease itself, entirely apart from the type of

operation performed. We can get a clearer idea of the relative dangers from Kehr who advocates and performs cholecystectomy more freely than other surgeons of prominence in this field. He reports a mortality of 1.5 per cent in cholecystostomy and 3.7 per cent in cholecystectomy. Even here however the cholecystectomies were as a group less seriously diseased. It is thus seen that the discrepancy is not so forbidding and warrants us in fitting the operation to the case when we are convinced that removal of the gall bladder is the operation of choice. Still cholecystectomy will remain an operation of slightly higher mortality as is inevitable from the more extensive trauma and greater time required for its performance.

The adherents of cholecystostomy make capital of the fact that the gall-bladder is a most valuable guide in the event of secondary operation being required. It is the thread of Ariadne which guides the surgeon through the maze of adhesions to the common duct. The gall-bladder and cystic duct in this respect bear the same relation to the common duct as the cecum and the anterior longitudinal muscular band of the cecum bear to the appendix. The adhesions subsequent to the primary operation are likely to be less dense and baffling after cholecystostomy than cholecystectomy.

To this the advocates of cholecystectomy reply that secondary operations will seldom be needed after the gall bladder is removed. Persistent fistulas are rare. The hive of infection is removed from further possibility of trouble, and in case re-operation is necessary the obstacles are by no means insuperable.

My own experience with these operations, their relative mortality and curative effects inclines me to be rather more radical than hitherto. I would still counsel the inexperienced surgeon to cling to cholecystostomy. Its results are often truly surprising in most complicated conditions. I have however had enough disappointments with cholecystostomy to believe that there are cases in which I should remove the gall bladder providing only that I am able to select them at the time of operation. The class of cases in which at

the present time I am inclined to favor cholecystectomy over cholecystostomy are those who give a long history of recurrent febrile attacks with more or less permanent gall bladder changes and showing evidence of peripancreatic lymphangitis often with some communicated inflammation of the head of the organ itself.

In most cases of acute calculous cholecystitis I remove the gall bladder. When localized gangrene is present I believe it should be removed except in the ultra severe types of infection already isolated by old or fresh adhesions as I have previously indicated. I do not remove gall bladders simply for old chronic changes unless the organ is practically destroyed and valueless or dangerous in appearance from the standpoint of malignancy.

In other words, gall bladders which we know from the symptoms and appearance to have become the seat of chronic infection with periodical exacerbations will in the majority of cases be best treated by cholecystectomy.

The age and resistance of the patient so far as we are able to estimate it, should be taken into account in our decision and we should not insist upon cholecystectomy in enfeebled patients who may by drainage survive and gain in strength to such a degree that removal can be done later if symptoms recur. Temporary improvement is the rule after cholecystostomy. Permanent cure results in the majority of cases, but in the chronic infection carriers cholecystectomy is more reliable from the standpoint of the ultimate result.

In other words I am inclined to give the findings of bacteriology more weight in deciding upon the type of gall-bladders which should be removed. A gall-bladder thoroughly and chronically infected which has evidence of chronic systemic intoxication and regional involvement of adjacent organs, notably the pancreas and peripancreatic retroperitoneal tissues I believe is too dangerous a source of future trouble to rely upon cholecystostomy for permanent cure and this is particularly true if drainage of the bile is not continued for a long period, provided simple cholecystostomy is performed. While cholecystectomy is, I believe, the operation

of choice in this class of cases for good and sufficient collateral reasons one will often content himself with cholecystostomy. In this case a large tube should be employed and not removed before two weeks have elapsed in order to create a firm sinus that will not close in less than six or eight weeks. By long continued drainage there is the greater chance of ridding the organ completely of its lurking infection and in our decision as to the operation to be employed we should ever bear in mind that the most serious question is that of infection and liability of re-infection. The biliary tract without a gall bladder particularly a damaged gall bladder is much less likely to become the seat of future micro-organismal invasions.

The removal of the gall bladder may be a matter of extreme simplicity or of the greatest difficulty according to the situation and degree of involvement by adhesions and inflammation. As a rule the stronger the indications for cholecystectomy the greater the operative difficulty.

While a liberal incision is required for this work, I have never found it necessary to employ the post mortem incision advocated by some surgeons. Neither do I use such incisions as that of Kehr which in addition to the vertical right rectus incision has an arm at right angles from the lower end of the vertical arm transecting the rectus muscle and semilunar line and splitting the flat muscles of the abdomen. Ample room can be secured by a slightly curved incision beginning just below the ensiform cartilage, following with a slight upward and outward convexity the costal margin then carried straight down between the fibers of the upper rectus as far as is required. With the relaxation of the abdominal walls such as can be secured by ether (but not with gas and oxygen) the operative field is clearly exposed. In some cases I dislocate the liver downward and upward bringing it partly out of the incision after the manner of Mayo Robson. This is accomplished by seizing the margins with gauze taking care not to crush the friable parenchyma. If this can be accomplished it brings the cystic and common ducts nearer the surface. In all cases I place a sand bag

under the lower thoracic spine for the same purpose.

It is important first to clear the adhesions from the gall bladder. When these are omental it is a simple matter but when firm union has taken place with the duodenum or other hollow viscous there is considerable danger of opening the bowel and contaminating the field. To obviate this the dissection should be made cautiously keeping close to the gall bladder rather than to the bowel. In the case of fistulous communication between the gall bladder and the bowel it will be necessary to open the tract and this should be done with as little searing and as much protection of the adjacent areas as possible. Having freed the gall bladder and cystic duct a clamp may be placed upon the duct, and the cystic artery. Then catching the duct again just distally to the first clamp the duct is cut between the two and the organ dissected from its fibrous bed from below upwards, leaving if possible a portion of the fibrous bed rather than dissecting it from the liver tissue which is more likely to leave a lacerated surface with oozing that is difficult to control, especially when jaundice is present. As the late Maurice Richardson has pointed out, it is necessary to use care in tying off the cystic duct not to pull up the common and hepatic ducts at their point of junction with the cystic which may lead to their being included in the ligature. An error which leaves the last state of the patient worse than the first. Indeed in all this work it is necessary to be thoroughly familiar with the normal anatomy and the variations which may occur whether of congenital or pathological origin.

It is usually possible to oversew the fovea of the gall bladder and obliterate it at once.

However well I may tie off the cystic duct and obliterate the fovea of the gall bladder I never close the abdomen without drainage fearing that the back pressure of the bile may force the ligature. We learn much from our disagreeable experiences.

Several years ago I performed a cholecystectomy with ligation of the cystic duct and complete closure of the abdominal wall. The vis a tergo of the bile forced the ligature on the cystic duct and a considerable amount of

bile escaped into the abdominal cavity. Fortunately it became walled off in the kidney well, and in a few days found its way out through the wound. This lucky result did not occur without much distress on the part of the patient and much worry on the part of the surgeon. Since that time I have never neglected to carry a small rubber tube down to the stump of the cystic duct and have not had this complication occur. Often the question of hepatic drainage must be met. Naturally if any obstruction exists within the common duct it will be necessary to open the duct and after dealing with the obstruction drainage must be instituted. Even when no definite obstruction exists but evidence of diffuse catarrhal cholangitis is at hand biliary drainage should be provided. At times this may be done by a rubber tube passed down the cystic into the common duct. If this is not possible the common duct should be opened directly and a rubber tube sutured in place. A curious anomaly which I have observed many times is a low implantation of the cystic duct into the common duct so that the lower part of the cystic duct may occupy the outermost portion of the free border of the gastro-hepatic omentum and be incised by the surgeon in the belief that it is the common duct. When this is the case it is necessary to direct the drainage tube downwards toward the common duct rather than upwards toward the liver as one would naturally do in placing a tube in the common duct to drain the bile as it comes down from the liver. If a T tube is employed it makes no difference. Common duct drainage should be provided whenever the pancreas or peripancreatic tissues show evidence of recent infection. To what extent common duct drainage is successful in draining the pancreas also is a question yet to be settled. Naturally such drainage could not occur in the cases in which the pancreatic duct fails to communicate with

the common duct, either directly or through the medium of the sinus of Vater. In one case during the past year I saw indisputable evidence of the drainage of pancreatic juice through the common duct. The attention of my assistant Dr Pfeiffer was drawn to this by the excoriation of the skin about the wound where the drainage from the duct tube had escaped. Testing the biliary discharge for the presence of the pancreatic ferments trypsin, steapsin and amylase were demonstrated. In certain other cases we failed to find these ferments. Even when the duct is not drained directly there seems to be no reason to doubt that biliary drainage is beneficial to the pancreas by allaying the cholangitis which is unquestionably a factor in the production of pancreatic inflammation.

If there has been marked acute pericholecystic inflammation or if soiling of the field has been unavoidable during the manipulations I frequently place a glass tube down to the renal fossa in the subhepatic space which is allowed to remain for twenty four to thirty six hours.

The wound is sutured in layers and the drainage allowed to emerge through one portion of it, or through a separate stab if that is the most direct route to the surface. I am fond of draining through a separate stab as that allows better closure of the long wound. Naturally when there is much drainage a stab is not advisable.

It is my practice to elevate the foot of the bed about six inches after an operation of this character believing that it is more rational to confine exudate and infection to the area of drainage than to try to gravitate them to the pelvis through uninfected peritoneum this position is maintained, however, only for 24 hours when the patient sits up in bed. The latter position lessens the chances of an embolic pneumonia. The after treatment is that usually employed in abdominal cases.

DRAINAGE OF THE UPPER INTESTINAL LOOP FOR THE RELIEF OF ILEUS BASED UPON EIGHT CLINICAL CASES SUCCESSFULLY OPERATED AND ANIMAL EXPERIMENTATION

By C. HUGH McKENNA, M. D. CHICAGO

Surgeon to St. Joseph's Hospital

CLINICAL observation over a large number of cases of acute bowel obstruction with its immediate and high mortality suggested to me making an investigation of the fatal factor in ileus.

On analyzing the cause of death from acute bowel obstruction it would seem that one of the three following factors must be made responsible for the fatal termination: bacteriological, nervous, or toxic.

1. The bacteriological factor may be eliminated since, (a) death comes too early and (b) bacteremia only rarely occurs.

2. From the standpoint of a primarily disturbed innervation, statistics, and our own observations in operative measures on the upper intestinal tract and stomach, seldom show any disturbance of this nature.

3. The toxic element, I believe in view of our clinical experience and animal experimentation and that of co-workers on this same subject, fully explains the cause of death in acute bowel obstruction.

I am of the opinion that when the physiological balance of the normal intra-enteric secretion (the secretion from the duodenal mucosa probably from Bruner's glands) is disturbed the secretion becomes profoundly toxic and unless this physiological balance is quickly restored, a fatal termination surely and swiftly ensues. In other words, any influence that leads to an upper intestinal paresis sufficient to stop peristalsis, blocks the normal flow of the duodenal secretion as effectively from the point of view of ileus, as if the gut were mechanically closed. I am of the opinion that the duodenal stasis produced by paresis of this portion of the gut may be compared to the duodenal stasis produced in the dog by closing the lower end of the duodenum. The blocking up of the duodenal secretion may become a fatal factor in one of two ways. First, by direct absorption into the blood as a powerfully toxic substance; second,

because of the improper mixture between the secretion of the duodenum and the secretion from the lower intestinal tract.

In the light of our clinical and experimental work, and the work of other investigators—particularly Whipple and Bernheim, it would seem as though we were justified in claiming that the fatal factor in ileus is a poisonous element derived from the duodenal mucosal secretion, the toxicity of which is brought about because of a disturbed interchange of secretions between the upper and lower parts of the small intestine. We are of the opinion that this toxic secretion is absorbed directly through the non-resisting parietic duodenal wall.

The point that is of especial interest to us in this connection as clinical surgeons is the beneficial rôle drainage of the intestine plays, in reducing mortality in cases of acute bowel obstruction. We have up to the present successfully operated eight cases of acute bowel obstruction by enterostomy. In the early cases it was more chance than any other factor that led us to make an enterostomy high in the small intestine. At any rate the opening was made high enough so that by means of long catheters introduced into the bowel, pancreatic secretion was poured out upon the abdominal wall. The presence of pancreatic secretion was first detected because of the very marked excoriation produced on the skin. In these cases and in subsequent cases, we were sure we noted a relationship between the welfare of our patients and the presence of pancreatic secretion at the intestinal opening.

The presence of pancreatic secretion at the site of the enterostomy proved the presence of duodenal secretion. In estimation naturally turned toward experimentally determining: First, whether liberation of the duodenal secretion causes the welfare of the patient and

Prof. John Knapton Kemp.

If so, what in the secretion is responsible for the reflux?

During my early experimental work four years ago on this subject, J. Draper Maury of New York, published a paper along this line and from his paper I have borrowed my classification of duodenal secretions.

Duodenal secretions

I Extra-enteric.

(a) Bile

(b) Pancreatic.

II Intra-enteric.

(a) Secretion from the glands of Bruner

(b) Secretion from the remaining duodenal mucosa.

Experimental work with dogs

A. Experiments on intestinal ducts not disturbed.

1 Lower portion of duodenum closed with a ligature animal dies usually in about 36 to 48 hours.

2 Lower part of ileum closed with ligature—gut is cut off by the silk and intestine re-establishes itself so that recovery takes place.

B Experiments on the bile and pancreatic ducts, with cholecystotomy

1 Extra-enteric secretion shut off from the intestine by applying ligatures to the common bile duct and the greater and lesser pancreatic ducts. Ligature found to close these ducts only temporarily and patency re-established.

2 Extra-enteric secretions blocked from the duodenum by double ligatures dividing the ducts between the ligatures. This procedure effectively prevents the re-establishment of either the bile or pancreatic ducts.

C. Secondary operations on the intestines of the dogs in which extra-enteric secretions were blocked from the duodenum with cholecystotomy

1 Second operation three weeks following first. Ligature applied to the lower portion of the duodenum. Dog lives. Intestine re-establishes itself.

2. Second operation three weeks following first, lower portion of duodenum closed by resection. Dog dies.

Dr H. R. Kenney's report on low obstructions from the experimental laboratory of St. Joseph's Hospital.

Dog No. I. January 3d. Operated 9 A. M. Bowel ileum picked up doubly ligated and divided. Proximal and distal ends sutured to peritoneum wound closed in usual manner. Enterostomy performed. Jejunum opened at 3 P. M. Peristaltic action of bowel markedly increased. No other microscopic findings.

January 4th. Dog in good condition, walking about and drinking water freely; enterostomy opening draining.

January 5th. Dog's condition unchanged.

January 6th. Dog's condition unchanged.

January 7th. Dog's condition unchanged. Wound where occlusion performed open and intestine draining there also.

January 8th. Dog killed with chloroform and post-mortem performed. No peritonitis present. Adhesions round site of occlusion. The occluding ligature round proximal end of intestine had cut through all the coats of intestine and allowed contents to escape through wound.

Dog No. II. January 9th. Operated 5 P. M. Clamp applied to ileum four inches above ileocecal valve. Abdomen closed in usual manner.

January 10th. Dog able to walk about and drink water.

January 11th. Dog seems better than on previous day.

Jejunostomy performed at 7 P. M., 50 hours subsequent to occlusion. Abdomen opened, left side and small intestines found dilated, no peristaltic movements noticed. Dog died from overdose of anesthetic and operation discontinued.

Post-mortem. Clamp site found completely shut off by adhesions and tight. (Specimen saved.)

Dog No. III. Operation January 11th, 7 P. M. Clamp applied as in previous case.

January 12th. Dog walking about, drinking water.

January 13th. Dog vomiting very stiff in hinder extremities. Dog died 3 P. M., 46 hours after application of clamp. Post-mortem. Acute peritonitis cause of death. Infection during operation. Clamp found imbedded in adhesions midway between pylorus and ileocecal valve.

Dog No. IV. January 15th. Operation 8 P. M. Clamp applied near ileocecal valve.

January 16th. Dog sick vomiting.

January 17th. Dog walking about better.

January 18th. Dog running about, drinking water.

January 19th. Dog stiff and vomiting. Enterostomy performed high up 1 P. M. One hundred and nine hours after application of clamp. Gut found enormously distended, dark red color etc.

January 20th. Dog very sick but able to stand up. Abdomen covered with discharge and skin red as if scalded.

January 21st. Dog very sick, unable to stand up moaning; chloroformed at 6 P.M. Post-mortem. No peritonitis. The enterostomy opening at the duodenojejunal junction. Mucous membrane proximal to opening red and inflamed. Gut below enterostomy wound normal until point about two inches above site of occlusion, where perforation had occurred. The site of the perforation was walled off from general peritoneal cavity by adhesions.

Dog No. V. January 27th. Ileum picked up. Ligated in two places. Divided ends inserted 9 P.M.

January 28th. Dog well, up and about, drinking water.

January 29th. Dog well, up and about, drinking water.

January 30th. Dog well, up and about, drinking water.

January 31st. Dog well, up and about, drinking water.

February 1st. Dog well, up and about, drinking water.

February 2d. Dog died at noon, 156 hours since occlusion performed.

Post-mortem. Ileus. Gangrene of gut. Perforation peritonitis.

Dog No. VI. Occlusion as in No. V. Dog lived 13 hours. Post-mortem findings identical with No. V. No enterostomy performed in these two cases.

In all the dogs bowel below obstruction site was loaded with contents. Dog in which occlusion site was high (in the jejunum as No. III) showed severest symptoms. This corresponds to what we know to be fact clinically that high obstruction in man is more rapidly fatal than low obstruction.

In every case the dogs seemed sicker on day following operation and seemed to vomit most.

The peristaltic action is completely arrested in the distal portion of the bowel, as soon as occlusion is performed and contents are retained. The lumen of the bowel is narrowed and filled with mucus and contents.

Peristaltic action above obstruction is at first exaggerated; this increased activity seems to have for its object removal of obstruction (which causes it) not the propulsion of bowel contents which do not seem to collect to any great extent above the obstruction. Fermentation of bowel contents causes formation of gas in intestine and increases the intra-intestinal tension. The mucous membrane is damaged owing to diminished blood supply.

When and from what point antiperistaltic

waves start, which have for their object the emptying of the intestine of its contents, has not been determined but when an enterostomy is performed it is obvious that antiperistalsis in efferent loop will continue if the obstruction lower down is its starting place, and if the bowel is not yet paralyzed. Normal peristaltic waves will recommence in and empty efferent end.

Whipple of Johns Hopkins showed that if 12-15 cm. of the duodenum was isolated by closing either end, and the intestinal current established around this loop, the dog dies. I have performed only one such experiment and in that case the dog had a fatal termination in 36 hours.

Since the publication of Whipple and Bernheim's last communication, they have succeeded in chemically removing the mucosa from the isolated loop of duodenum above referred to and in these experiments the dog lived.

These last experiments would seem to establish a logical reason for delivering the duodenum of its contents in conditions of acute stasis.

Can the duodenal secretions be drained off per os by means of the stomach or duodenal tube? I believe not.

(a) Clinical experience in these cases with duodenal lavage has not given good results.

(b) Anatomically it would be difficult to remove all secretions from the duodenum, and particularly so in cases of acute paresis of this portion of the intestinal tract.

(c) Drainage of the duodenum must be permanent until the paresis of the bowel has completely subsided.

Permanency of drainage of the duodenum can most effectively be established by an enterostomy preferably high up in the jejunum. However I am of the opinion that if the operation be performed early enough, enterostomy in any part of the small intestine may give relief.

The operation of enterostomy which is always performed under local anesthesia, is made well above and to the left of the umbilicus as this location gives entrance to the abdominal cavity at a point where the upper portion of the jejunum can be picked

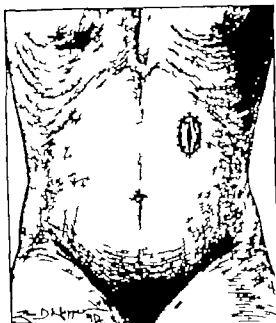


Fig. 1. Anatomical position for jejunostomy in the upper portion of the jejunum.

up most accurately. We always pick up the first loop of small intestine that presents itself at the site of the opening which I believe in a large percentage of cases will give a loop of small intestine well up in the jejunum.

Through the courtesy of Dr Wm. R. Cubbins, in his course in operative surgery at the Northwestern University Medical School,

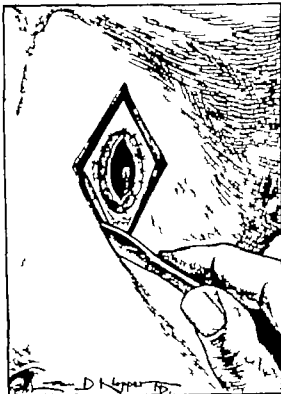


Fig. 2. Incision used in closing enterostomy.

I experimented on a dozen or more cadavers picking up the first loop of small intestine that presented in an incision at the left border of the left rectus muscle well above the umbilicus. In practically every instance the jejunum was picked up in the first four or eighteen inches of its beginning.

I cannot urge too strongly the necessity of preventing trauma and shock to the abdomi-



Chart. The upper abdominal viscera of the dog. A, stomach; B, large pancreatic duct; C, small pancreatic duct; D, gall-bladder.

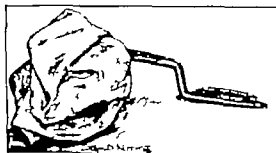


Fig. 3. Curved forceps is clamped around the stomach and the parietal peritoneum.

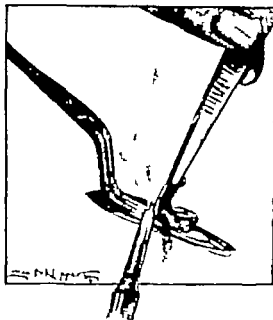


Fig. 4. Illustration of the plan of turning of the external infected portion of the intestinal opening.

nal viscera by non interference with any but the very small loop of dilated intestine in which you wish to establish enterostomy. For this reason I have always maintained that consultation should be arranged in all cases so that a definite plan of action may be laid down which will enable the surgeon to understand precisely what he intends to do before the operation. I have seen failures of this operation and have had others reported to me in which an abdominal cavity was opened in an acute ileus where the operator after traumatizing large portions of the viscera and finding no organic obstruction performed enterostomy. It is needless for me to tell you that with a patient in the extreme degree of shock in which we find them in acute ileus this extra amount of manipulation of the abdominal viscera is enough *per se* to produce death. With a few minutes lessening the amount of trauma to the viscera and shortening the time required to perform enterostomy I have turned to the possibility of arranging some mechanical device for this purpose. In this connection I wish to state that Dr. Wm. C. Lusk, of New York, has recently described such a de-

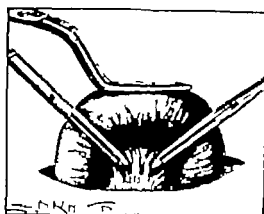


Fig. 5. Clamp applied to the bowel preparatory to applying the abdominal wall suture.

vice for this purpose. I have not had an opportunity to use this instrument, but the principle according to description appears to be correct.

Considerable stress should be placed upon the technique of this operation for I am of the opinion that the life of the patient depends upon the technical precision accompanying this procedure. Whether this operation be performed by the suture method or by a mechanical device two principles must obtain to insure success: accurate and immediate approximation of the serous covering of the bowel to the cut edge of the skin and drainage of the upper loop of intestines at least by means of a tube.

A loop of intestine emptied of its content and held in the wound with a curved pair of rubber mouthed forceps. A small portion of the intervening portion of bowel is then held to the cut edge of the skin by means of closely applied Lembert sutures. These sutures which are of linen must approximate the bowel to the cut edge of the skin as before stated and the upper and lower angles of the wound so closely that for the first six hours following the enterostomy there can be no leakage back into the peritoneal cavity. In other words these sutures must coffin in the peritoneal cavity from the incision of the intestine until placental exudate is thrown out around the bowel.

We still continue to introduce normal salt

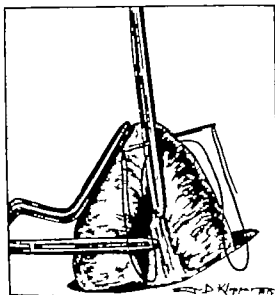


Fig. 6. Applying the shoemaker's stitch.

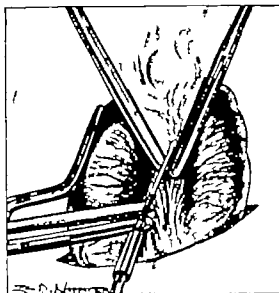


Fig. 7. Resection by means of the electrocautery

solution into the intestine by means of long catheters introduced into the intestine through the enterostomy. One catheter is placed in the oral loop of intestine, the other in the aboral loop. The salt solution is allowed to run in at frequent intervals, but in small quantities. Several hours are necessary before any appreciable amount of distention is relieved.

The salt solution performs a dual rôle. First, in mechanically washing out the blocked up secretion and gas from the duodenum, and second on account of rapid absorption from the intestine becomes a powerful stimulant.

Under ordinary circumstances the enterostomy may be closed in about two weeks. The time of this operation, however, must be determined by the condition of the patient.

We have adopted the following plan in closing the intestinal fistula, which is demonstrated in the accompanying charts.

With the patient on the operating table anesthetized and a preliminary preparation of the abdomen made, an elliptical incision is made around the opening down to the peritoneum, using great care not to open this membrane. A curved intestinal forceps is now applied to the enterostomy stoma, grasping down well to the peritoneum with

the forceps so that the infected portion of the gut distal to the bite of the forceps may be burned off with the cautery. After this procedure the abdomen is cleaned and aseptized without recontamination. The operation can now proceed as a clean abdominal section.

A resection of the fistula with a lateral anastomosis of the intestines is made.

We use the following technique in closing the end of the intestine, which has the advantage of (a) asepsis, (b) hemorrhage, (c) time saving, (d) surgical precision. A grooved intestinal clamp is placed on the intestine and a mattress stitch applied in the groove of the forceps with a linen stitch threaded with a needle on either end — just as a harness maker sews a harness trace — another intestinal clamp is placed on the intestine parallel to the first, leaving just enough space to burn the intestine off with a thin bladed cautery. The mattress type of stitch gives a thin edge that is easily invaginated with a Lembert suture. I believe this type of stitch is preferable to the circular ligature applied to the intestine, similar to the appendix ligature and used by many surgeons in doing an intestinal resection.

The lateral anastomosis is made in the ordinary way with intestinal clamps and the Czerny and Lembert suture.

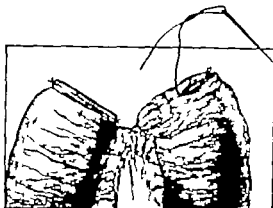


Fig. 8. Applying Lembert suture over the end of the bowel.

I have attempted to group the symptoms of ileus as they have appeared to me in the observations that I have made in my own experience. They are as follows:

- (a) Marked abdominal pain
- (b) Abdominal distention.
- (c) Weak, thready and rapid pulse.

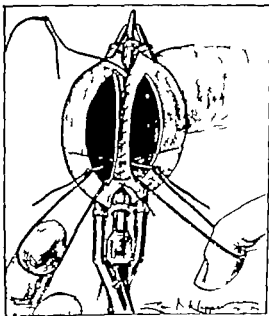


Fig. 9. Shows the type of suture used in the lateral anastomosis.

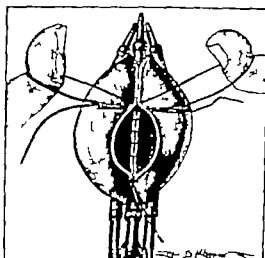


Fig. 10. Same suture as Fig. 9 carried to the anterior portion of the anastomosis.

- (d) Hypocratic face.
- (e) Fecal vomiting.
- (f) Early in the disease, visible peristalsis.
- (g) Regional distention (in some cases)
- (h) Signs of peritonitis.
- (i) Relief from the pain of onset.
- (j) Alteration of kidney function.
- (k) Marked leucocytosis.
- (l) Marked lowering of blood pressure.

With the amount of literature coming in from various centers, and particularly with the favorable results where operation is not delayed, it would seem that operative intervention in acute bowel obstruction should be instituted earlier than is generally the plan at present.

From our own experience we are firmly convinced that operation should not be delayed in these cases.

CONCLUSIONS

Disturbance of innervation to the upper intestinal tract in the human sufficient to stop peristalsis produces the same symptoms as mechanically blocking the same amount of intestine in the dog.

High intestinal stasis, whether paralytic or mechanical, is much more serious than low obstruction. The fatal factor in acute ob-

struction may be found in the secretions from the duodenal mucosa.

That the fatal factor in general peritonitis may be due to a duodenal secretion and not to the effect of infection *per se*.

That when the condition of acute ileus is definitely established, the duodenum should be drained early.

Lastly that the duodenum can best be drained by performing a jejunostomy.

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PRELIMINARY REPORT ON EXPERIMENTAL BONE AND PERIOSTEAL TRANSPLANTATION¹

By W. L. BROWN, M. D. and C. P. BROWN, M. D. EL PASO, TEXAS

FIRST WILL PERIOSTEUM PRODUCE BONE WHEN TRANSPLANTED INTO TISSUES WITH OUT BONY CONTACT?

EXPERIMENT January 8, 9:3, white and tan fox terrier age unknown. All of periosteum taken from the right femur divided into four pieces, one piece planted into each shoulder subcutaneously and one into each loin, the muscle after opening the sheath. Sheath was closed with oo plain gut skin with oo chrome. Incision over the femur closed with horse-hair muscles sutured over femur with oo plain gut. Primary union.

Sacrificed by chloroform in 30 days. Wounds were healed with very little scar tissue. No thickening could be felt through the skin over areas of transplant. Upon most careful examination no trace could be found of the transplanted periosteum except a small scar in the right loin, adhered to the under side of the muscle sheath the size of a grain of wheat, with no evidence of bone formation.

Experiment January 8, 9:3 small black and tan dog, weight pounds, age unknown. All of periosteum taken from the right femur divided into four pieces, one piece planted into each shoulder subcutaneously and one into each loin inside the muscle sheath. The sheath closed with oo plain gut muscle with oo plain gut skin oo chrome. Primary union.

Sacrificed 30 days later wounds healed without visible scar no thickening to be felt

from the outside except small movable hard body apparently the size of a large grain of wheat attached to the under surface of the fascia in the left loin. Upon making most careful examination no traces of transplants could be found except the small scar as above stated, which microscopically showed no bone cells. In these eight free periosteal transplants there was no evidence of bone production found, and the transplants themselves were absorbed at the end of 30 days the two small nodules recovered only being scar tissue.

SECOND WILL PERIOSTEUM PRODUCE BONE WHEN LEFT ATTACHED TO BONE AND PERIOSTEUM AT PROXIMAL END PARSSED AROUND FASCICULI OF MUSCLE AND AGAIN CONTACTED WITH PERIOSTEUM?

Experiment 3. March 19, 9:3, white and black mongrel, weight 35 pounds both femurs bared and strip of periosteum $\frac{1}{4}$ inch wide and $1\frac{1}{2}$ inches long raised from each femur pulled through slit in muscle, and again attached to periosteum, right side twisted on pedicle half round, left not twisted. Brought back and attached to periosteum, right side muscle not sutured left side, sutured with oo plain gut skin closed with horse-hair. Dog was muzzled tightly with wire muzzle, but had the sutures out at the end of 36 hours, wounds gaping. Killed 5 days later following extensive infection. No post-mortem.

Experiment 4. March 21, 1913 brown spotted mongrel, young both femurs bared, and strip of periosteum raised one inch long and one half inch



Fig. 9. Showing removal of spine of scapula, resected forty-seven days after transplant, beside of muscle sheath in situ, covered like peritoneum. Notice thin, sharp edges and dimensions compared like area from which it was removed.

wide, passing through muscle back to the bone and sutured to the perosteum left attached at proximal end. Muscle wound closed with catgut, skin with horse hair. Primary union.

Sacrificed May 3, 1913. No traces of the perosteum found in the muscle tissue but at the point of re-contacting with the femur there was a bony spur $\frac{1}{4}$ inch long extending out into the muscle. This growth, as can be seen comes from the bone. It is much larger at its base in contact with the shaft and comes to a point where it projects into the muscle. It is evidently due to scraping of the bone at this particular point in raising the perosteum because of being in line of the muscular attachment to the femur the perosteum here being much more adherent and much more difficult to raise. No evidence of bone having been reproduced by raised flap.

Left femur shows no evidence of bony reproduction in raised perosteal flap except at its tip where it was re-contacted with the bone and here apparently in the end of the perosteal flap is a little bony nodule $\frac{3}{8}$ inch in diameter. It seems to have no attachment to the shaft, though there is a bony outgrowth from the shaft beneath it. This bony growth on the shaft is in the line of muscular and fascial attachments to the femur and also represents an outpouring of osteoblasts from the trauma in raising the perosteum. Considering the fact that there is no bone in this flap of perosteum anywhere else except at the tip, this corresponding to the outgrowth beneath, leads one to the conclusion that the osteoblasts raised from the shaft were left in the end of the perosteal flap.

Experiment 5. March 20, 1913, small spotted mongrel, old, both femurs bared and strip of perosteum $1\frac{1}{2}$ inches long $\frac{3}{8}$ inch wide, raised, left



Fig. 10. Showing effects thirty days later of removal of perosteum from femur. New fibrous membrane, somewhat more adherent than normal perosteum, slight roughening of bone, and slight change of color otherwise no evidence of change. Bones perform their functions as well as before. Other femur control specimen.

attached at proximal end, passed through muscle back to bone, reattached to perosteum, wound sutured with catgut, skin with horse hair. The perosteal strip kept from rolling as far as possible skin closed with horse-hair. Primary union.

Sacrificed May 3, 1913. In the right femur the perosteal flap had completely disappeared. No change in the shaft in any way. No reproduction of bone. In the left femur the perosteal flap had completely disappeared, except a very small fragment sticking into the muscle tissue where reattachment was made to the femur. No production of new bone.

Experiment 8. Young bound, black and tan, weight 5 pounds, right femur exposed, perosteum turned up from below, divided into two strips and



Fig. 11. Showing removal of spine of scapula, wired to its place of articulation. Space between costal spines originally filled with new bone. Preparation of specimen as he wanted to add to reserve soft tissue; photographer undertook to improve specimen by boiling, consequently destroyed nearly all of the new bone.



Exp. 14. Showing result of spine of scapula transplanted and contacted to two vertebral spines one, ear and fourteen days after experiment. Notice bone filling in space between the spines from the graft, also evidence of absorption in the front end of the graft. False joint evidently from lack of immobilization, and also thickening of posterior spine, evidently due to throwing out of osteoblasts after scraping and trauma. Gresses just under tip of this spine show upper border of transplant.

passed into the muscles, left attached at the upper end, and the lower end left in the muscles without perosteal contact. Muscle wound closed with oo plain gut skin with horse-hair. Removed his own stitches on the second day, wound opened and dog died of infection one week later. Post-mortem, the time having been too short to disclose anything of value.

THIRD WILL BONE REPRODUCE BONE AND CONTINUE TO LIVE WHEN DEPRIVED OF PERIOSTEUM AND TRANSPLANTED INTO THE TISSUES WITHOUT CONTACT WITH LIVING OSTEOGENETIC TISSUE?

Experiment 6. February 10, 1913. Brindle mongrel, four years old, weight 15 pounds. Puppies, one male and one female nine days old. Male sacrificed with chloroform both femurs of sacrificed puppy denuded of periosteum, cut in small pieces and transplanted as follows. First. One piece



Exp. 6. Showing remains of rib transplanted and contacted with three vertebral spines after removal of periosteum. It shows also of original transplant, no bony union at either end. Notice the rapidity of absorption at these points, and less evidence of absorption at point of bony contact. Lack of union probably due to insufficient traces of spines and insufficient immobilization due to use of silver tray; holes showed where the other two wires were.



Exp. 7. Showing remains of puppy split femur sixty-five days after being transplanted on to mother femur very little bone remaining. Wires showing original size of transplant, only partial union of graft, nearly all absorbed.

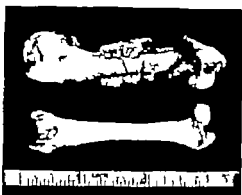
$\frac{1}{8}$ inch long by $\frac{3}{16}$ inch wide and $\frac{1}{8}$ inch thick, weight 4 gr. planted into the right loin inside the muscle sheath. Sheath closed with oo plain gut skin with horse-hair. Second. Piece $\frac{3}{16}$ inch long, $\frac{1}{8}$ inch wide at broad end and $\frac{3}{16}$ inch wide at narrow end, weight $3\frac{1}{2}$ gr. Into the right shoulder muscles inside sheath. Sheath closed with oo plain gut and skin with horse-hair. Third. Into the right thigh, cross section of femur $\frac{3}{16}$ inch in diameter, $\frac{3}{16}$ inch thick with medullary substance intact, weight 4 gr. inside muscle sheath. Sheath closed with oo plain gut skin with horse-hair. Fourth. Into left thigh piece of femur $\frac{1}{4}$ inch long, $\frac{1}{8}$ inch wide, $\frac{1}{8}$ inch thick, weight 4 gr. inside muscle sheath. Sheath closed with oo plain gut. Fifth. Subcutaneously into left loin, piece of femur $\frac{1}{4}$ inch long, $\frac{3}{16}$ inch broad at wide end and $\frac{3}{16}$ inch at narrow end, $\frac{1}{8}$ inch thick, weight 1 gr. Skin closed with horse-hair. Sixth. Subcutaneously into left shoulder, piece $\frac{1}{2}$ inch long, $\frac{1}{8}$ inch wide at one end and $\frac{3}{16}$ inch wide at other end, weight 3 gr. Skin closed with horse-hair. Primary union throughout.

These experiments were made with a view of taking out a specimen every week or ten days for microscopical examination. Results. March 10, 1913, 28 days after experiment, under anesthesia, the piece was removed from the left shoulder and was found to be adhered and encapsulated. As near as could be made out it was slightly smaller than when put in. Microscopical section showed cavities and fragmented nuclei, marks of degeneration — no evidence of regeneration.

On March 23, 41 days after the original experiment, under anesthesia a careful search was made for the piece in the left loin, but no traces of it could be found, not even a scar, evidently completely absorbed. The dog was sacrificed April 8, 57 days after experiment, and under the most careful dissection no traces of the transplants could be found, all completely absorbed.



Exp. 80. Showing bone sixty-four days after experiment. Here two and one fourth inches of the ulna was removed, including all of the periosteum, the results of which is shown in experiment 6. This space now measures one and one eighth inches, one half its original length. Notice the greater amount of reproduction has been from the proximal end, probably due to the greater blood supply.



Exp. Showing both femurs one hundred and ten days after experiment. Growth in length equal. The foil and wax in place. Some restriction of bone under foil. Wire partially buried at lines-apart. New layer of bone one-tenth inch thick over most of surface covered by foil.

FOURTH WILL BONE LIVE AND REPRODUCE BONE WHEN TRANSPLANTED INTO THE TISSUES, NOT DEPRIVED OF ITS PERIOSTEUM AND NOT CONTACTED WITH LIVING OSTEOGENETIC TISSUE?

Experiment 7. March 9, 1913 small brown fox terrier female 4 months old left spine of scapula with muscle attachments and periosteum planted into the left loin, within the muscle sheath, no contact with bone. Sheath closed with oo plat gut all with oo chromic gut. Primary union.

Sacrificed September 15, 1913 6 months and 5 days after experiment. No trace of bone could be found after most careful dissection.

Experiment 8. March 9, 1913 spotted white and black female fox terrier 9 months old, weight 4 pounds. Right spine of the scapula removed with muscle att. removed and periosteum left intact. The piece being 1 inches long and 1 inch wide at the broad end and 1/4 inch at the narrow end, planted into the right loin within the muscle sheath. No bony contact. Sheath closed with oo plat gut all with oo chromic gut. Slight infection. Healed in few days, evidently superficial.

Sacrificed March 24, 1913 being one year and 4 days following the experiment. Slight scar at site of operation but upon most careful dissection no trace of the transplant could be found completely absorbed.

Experiment 9. January 5, 1913, brindle mongrel 4 months old weight 5 pounds, left spine of scapula removed with muscle attachments and periosteum, planted into the loin on same side, inside muscle sheath. Sheath sutured with oo plat gut, no bony contact. Skin closed with horse-hair. The right spine was also removed with muscle attachments and periosteum intact transplanted into the right loin within the muscle sheath sheath sutured with oo plat gut skin with horse-hair. Primary union in both experiments.

Sacrificed February 21, 1913 39 days after experiment. Fibrous band 3/4 inch long found in the right loin. After careful dissection no bone could be found evidently absorbed. In the left loin a piece of bone recovered one half its original size and encapsulated as shown by the specimens, from which the spines were removed the one from the right side which was found to be completely absorbed was only one half the size of the one planted into the left. This evidently accounting for the fact that the left piece was not absorbed because of its greater dimensions, it was greatly reduced in all dimensions, the edges being absorbed to a sharpness. In neither case was there any evidence of regeneration.

Experiment 10. January 5, 1913, two dogs 1 experiment 9, answering to same description. Left



Exp. Sixty-eight days following experiment. Shows bowing of radius, fibrous tissue filling gap, also silver wire indicating original size of transplant. No bony reproduction.

spine removed with muscle attachment and periosteum intact, transplanted into the left loin within muscle sheath without bony contact. Sheath closed with oo plain gut skin with horse-hair. Right spine removed with muscle attachment and periosteum intact, piece being $\frac{3}{4}$ inches long, 1 inch wide at the broad end and $\frac{1}{4}$ inch at the narrow end, transplanted into the right loin within muscle sheath without bony contact. Sheath closed with oo catgut, skin with horse-hair.

Sacrificed March 24, 1913 2 months and 19 days after experiment. After careful dissection, no trace could be found of the left spine the right was recovered being firmly adherent and encapsulated piece being 1 inch long and $\frac{3}{4}$ inch wide at broadest place and thin as 2 ply note paper being half its original dimensions, sharp edges showing evidence of absorption. No evidence in either case of production of new bone.

FIFTH WILL BONE LIVE AND REPRODUCE BONE WHEN TRANSPLANTED AND CONTACTED WITH LIVING OSTEOGENETIC TISSUES?

Experiment 3 March 9, 1911 small brown fox terrier female, four months old. Right spine of scapula removed with muscle and periosteum intact. The muscular attachments and periosteum were scraped from one side and this was contacted with two vertebral spines in the lumbar region after they had been bared and the periosteum scraped away, the periosteum and muscular attachments were left on the opposite side of the transplant and it was fastened to the spine of the vertebra with silver wire. Fascia was closed with oo plain gut skin with oo chromic gut. Primary union.

Sacrificed September 15 1912 6 months and 5 days after the experiment. The transplant had lost its identity the space between the two spines of the vertebrae being completely filled with new bone the same thickness of the spines. They were completely agglutinated together with bony tissue. The wires were still in place but buried with bony deposit.

Experiment 14. March 9, 1910 Small spotted white and black female fox terrier 9 months old. Left spine of the scapula measuring inches long by $\frac{1}{4}$ inches by inch, removed with muscular attachments and periosteum the muscular attachments and periosteum were carefully scraped from one end and this was placed in contact with lumbar vertebral spines, after they had been thoroughly exposed and scraped, removing the periosteum. Co tact

was maintained by clips, such as are used in closing the skin. Fascia closed with oo plain gut skin with oo chromic. Primary union.

Sacrificed March 24, 1913 one year and 14 days following the experiment. Extensive proliferation of bone interspace between the spines filled with bone same thickness of spine front end of transplant showed some evidence of absorption tip of one spine twice its original thickness, this probably due to scraping causing outpouring of osteoblasts a peculiar thing about the specimen being a false joint formed between the anterior spine and its contact with the graft. Outline of graft lost.

Experiment 5. January 4 1913 black mongrel 4 months old, weight 20 pounds. The right ulna removed, including the periosteum, this afterwards scraped off and the periosteum scraped from the left side of three lumbar vertebral spines. The ulna was wired to these, hole being drilled through each spine, the wire thrown around the transplant fascia closed with oo gut and skin with oo chromic gut. Extensive infection and dog killed 9 days later N. post-mortem.

Experiment 6 January 17 9 3 black mongrel 4 months old, weight 20 pounds, $\frac{3}{4}$ inches of right ulna removed, periosteum scraped from one side only, contacted to three lumbar spines by three wires on the left side, after periosteum being removed from the spines wire thrown completely around transplant, no holes being drilled in it holding it firmly to the plates fascia closed with oo plain gut skin with oo chromic. Primary union.

Sacrificed March 13 1913 being 56 days following the experiment. No visible scar in the skin the wires through the two front spines were broken back wire still in place but much too large loop for the present implant. No union between the implant and posterior and anterior spine bony union between the middle spine and implant. The implant measures $2\frac{1}{4}$ inches in length much reduced in diameter thoroughly honey-combed especially marked at each end where there was not bony union showing evidence of rapid absorption. Specimen larger in the center where there was bony contact, and evidence of absorption not so well marked, transplant not more than half its original diameter Immobilization incomplete no union in two points, showing silver wire not to be satisfactory for this work.

Experiment 7. January 10, 1913 spotted fox terrier 3 months old, right femur bared, scraped, two holes bored through it and one half of split femur from her own pup three weeks old, including the diaphysis only placed on this surface with the split side contact; 2 two silver wires were thrown completely around it, holding it to the femur. No holes were bored in the transplant. Muscles were sewed over it with 00 plain gut fascia, 00 chromic gut and wound closed with 00 chromic gut. N splint or other form of immobilization was used. Primary union.

Sacrificed March 24, 1913, 65 days after experiment. Transplant nearly all absorbed, two wires still in place, showing original size of the transplant, a small piece of transplant 1 inch long still remaining at the lower end, still being about $\frac{3}{4}$ inch wide at widest end running into a point at thinnest, being $\frac{1}{8}$ inch. The surface of femur where scraping was done transplant made slightly irregular and roughened, showing new deposit of bone the parts remaining were where best union had occurred the surface of the transplant being somewhat irregular it was impossible to get perfect contact throughout. No evidence of reproduction of bone in the graft.

Experiment 18. January 9, 1913 spotted fox terrier 3 months old left femur bared, scraped, two holes bored through it and one half of the split femur from her own pup three weeks old, including diaphysis only sutured to this surface, the split side contacting. Wires thrown completely around the transplant 00 holes drilled in it muscles sutured with 00 plain gut fascia with 00 chromic gut and skin with 00 chromic no effort made to immobilize leg. Primary union.

Sacrificed March 24, 1913 65 days after experiment. Transplant nearly all gone, leaving principally an irregular rough surface on the femur. This transplant was more nearly absorbed than the one just preceding, and was likely smaller to begin with the wires were still in place which showed the original size of the transplant. What small particles of the transplant remain are rough and honey combed, showing that absorption is going on. The surface of the femur that was scraped was somewhat roughened no evidence of reproduction of the bone from the transplant.

SIXTH WILL BONE REPRODUCE BONE WITH OUT THE AID OF PERIOSTEUM?

Experiment 9. February 9, 1913, young black and tan hound weight 5 pounds right femur as

exposed all of periosteum removed to near the epiphyseal line and silver wire ring was placed around the center of the femur and this was covered with 4-ply tin-foil wrapped completely around the bone, covering an area of 2 inches in length (this to prevent the muscles or other tissues from coming in contact with the bone deprived of its periosteum. This tin-foil was tied around the bone at each end with 0-day chromic catgut, muscles were sutured in place with 00 plain gut skin with horse-hair collodion and cotton dressing. Removed his own stitches on the second day wound opened and dog died of infection one week later N. post-mortem.

Experiment 20. January 17, 1913, black mongrel 4 months old weight 30 pounds. Right ulna removed, not disturbing either epiphyseal line, being cut out with bone forceps, taking the entire periosteum with it, the piece measuring $\frac{1}{4}$ inches length muscles not sutured fascia closed with 00 chromic gut skin 00 chromic gut. Primary union.

Sacrificed March 13, 1913 54 days after experiment. Space in ulna only $1\frac{1}{4}$ inches in length, only half of its original length. There had in 54 days been reproduced $1\frac{1}{4}$ inches of bone and this almost wholly from the proximal end. This is interesting because of the fact that the nutrient artery enters the bone at the proximal end, thereby giving this part more blood supply. This new growth of bone ran out to a sharp point, where it terminated, both at the proximal and distal ends.

Experiment 21. February 20, 1913 mongrel pup of small breed about 4 weeks old weight $\frac{1}{4}$ pounds. Right femur exposed all the periosteum removed between the epiphyses, silver wire ring put around femur in the center tin foil 4-ply wrapped around the femur for space of $\frac{1}{4}$ inch, this being about as long an area as possible to use because of the small size of the bone tied around at each end with 0-day chromic gut to hold it in place so that it would not be disturbed by the muscles until adhesions formed around it femur measuring 1 inch from tip to tip including the joint surface. Muscles closed with 00 plain gut and skin with horse hair. Primary union. X-ray plates made May 3, 9, 13, 23 days following the experiment, showed the tin foil and silver ring in perfect position, and the bone to be growing normally as compared with the opposite femur impossible to tell whether or not the silver ring had been covered with bone, because of the density of the tin foil.

Sacrificed June 10, 1913 10 days after experiment. The right femur was found to be the same length as the opposite measuring 3 inches, having grown in length one inch since the experiment. The tin foil was in position as originally placed. It had constricted the

growth of the bone, the new deposit at the upper end showing a decided line of demarcation. There was a deposit of new bone $\frac{1}{4}$ inch thick extending half way around the part covered with the foil the silver ring was partly covered in the region of the linea aspera otherwise there was no deposit surrounding it. While there was growth of bone under this foil it was very greatly restricted, probably because the foil had been wrapped twice around the bone and restricted the reproduction mechanically from pressure. The bone grew in length, keeping pace with the opposite femur and functionated perfectly. The puppy never showed any evidence of disability after the first few days following the experiment.

Experiment 2. April 913 small old black and white mongrel female has pup 9 days old $\frac{3}{4}$ inch of the right ulna removed including all the periosteum, gap filled with femur of pup, end not contact periosteum all removed from transplant, held in place at upper end by being beveled and placed in medullary cavity after this had been reamed out. Lower end held in place by fine piece of silver wire, muscles sewed closely over implant with oo plain gut, skin with horse-hair collodion dressing, bandage and wood fiber splint. Pup bone was so soft that it could be cut with scissors each articulating end was cut off of the implant. Dressings remained in place nicely and primary union.

Sacrificed June 10 1913 68 days following the experiment. There was found some bending of the radius due to the lack of support from the ulna the silver wire at the lower end of the transplant was still in place showing the original size of the puppy's femur. There had been no bony reproduction from the transplant and nothing remained in the gap but a fibrous cord. Result same as other experiments with young bone. Experiments 17 and 18 showed no evidence of reproduction though in contact with living bone.

Experiment 26. April 8, 913 small white female mongrel weight 6 $\frac{1}{2}$ pounds right ulna bared all the periosteum removed completely separated from its close proximity to the radius and piece inch long removed from the lower third remainder of the shaft left in the muscles without periosteum and without other bony contact. Bleeding occurred from proximal end of the shaft muscles sutured, oo plain gut, skin with horse hair collodion dressing covered with bandage and adhesive plaster object of this experiment being to determine if this ulna will grow out from the proximal end as it did in experi-

ment 25 where the periosteum and bone had been cut off evenly no periosteum whatever being left in this case. Primary union.

Sacrificed June 10, 1913 62 days after the experiment. The gap between the ends of the bone measures slightly less than $\frac{3}{4}$ inch. The proximal end of the ulna shows evidence of regeneration for a distance of $\frac{3}{4}$ inch distal end absorbed to a sharp point, radius bent somewhat due to lack of support from the ulna as in experiment 20 all of the reproduction was from the proximal end.

SEVENTH IS IT ESSENTIAL THAT THE TRANSPLANT HAVE A FUNCTION IN ORDER TO BE PERMANENT?

This question came up because we had observed in experiments 17 and 18 where the puppy's split femur had been contacted with its mother's bared femur had become partially united, and later absorbed. This would suggest the possibility that absorption had taken place because this transplant had no function to perform. We then conceived the idea of doing the following.

Experiment 23. April 1 913 black and white mongrel 4 months old weight about 8 pounds. Right femur exposed a section of bone taken out of the center of it, including one third its diameter and $\frac{1}{4}$ inches in length the periosteum not disturbed and muscular attachments not disturbed. This was split if from the shaft of the bone, turned back into the muscles, the periosteum acting as a hinge the muscles drawn down between it and the shaft of the bone, and from which it had been split, and sutured in place to prevent it having any bony contact. Muscles closed with oo plain gut skin with horse hair. All that was done in this case was to throw the section of bone out of function without disturbing the periosteum or circulation any more than possible. Of course the circulation to a considerable extent was interfered with. Collodion and cotton dressing bandage and adhesive plaster. It was learned from the keeper immediately after operation that this dog and its mate had both been sick for several days with diarrhoea. He seemed to never recover from the operation, and died on the 7th day. A post mortem was made being too early to be of value.

IS PERIOSTEUM ESSENTIAL TO THE LIFE AND GROWTH OF BONE?

Experiment J. May 8, 1913 bite and in fox terrier age unknown. All of periosteum removed from the right femur muscles and sheath closed with oo plain gut skin with horse-hair. Primary union.

Sacrificed February 7, 1913, 30 days following the experiment. Upon exposing right femur it was found that the muscles were firmly attached to it by a thin fibrous membrane resembling in every way the normal periosteum, except possibly more firmly adherent to the bone. The bone was smooth and healthy in every respect, showed no evidence of having suffered because of removal of the periosteum.

Experiment 12. January 8, 1913, small black and white mongrel dog, age unknown. Right femur bared, all of periosteum removed, muscles closed with co plain gut, skin with horse-hair.

Sacrificed February 7, 1913, 30 days after the experiment. Description same as in No. 11. The bone showed no evidence of having suffered because of loss of periosteum and had a firmly adherent fibrous membrane resembling the original in every way except slightly more adherent.

Experiment 24. To further determine whether or not young bone would reproduce itself when transplanted free into the tissues without bony contact, the two following experiments were made from the bones of dog or puppy. Black and white spotted fox terrier, 3 months old, her own puppy 3 weeks old sacrificed with ether and pieces, each long of the tibia was placed into the muscles of the back within the muscle sheath, another piece, each long of the fibula from the same leg of the puppy was placed in the opposite side in the same way, neither implant having any bony contact. The periosteum and articular ends were removed from both. The wound in the right side of the back where the tibia was transplanted was infected and the transplant was either destroyed or thrown off. The tissues evidently not as tolerant of large free transplant as of the small. Primary union of the left wound where the fibula was implanted.

Sacrificed March 24, 1913, 65 days after experiment. After careful dissection no evidence of bone in the right side of the back where the tibia was transplanted, small piece of fibula was recovered from the left side.

Experiment 5. April 9, 1913, small old black and white mongrel female, has puppy 9 days old. Piece of split fem. $\frac{1}{2}$ inch long planted subcutaneous only in the right loin, skin closed with horse-hair. Primary union.

Sacrificed May 3, 1913. The specimen recovered was almost as long as when transplanted but was much smaller in every other diameter showing evidence of rapid absorption.

TECHNIQUE

In all of our earlier experiments we used ether anesthesia preceded by morphine $\frac{1}{2}$ hyaline $\frac{1}{2}$ two doses hyperdermically half hour apart preceding the anesthesia. We found these dogs did not take the anesthetic any better and were often very nauseated and noisy following the operation. We then adopted the plan of giving straight ether and never had a fatality and the dogs were much more quiet following the operation. Our routine method of preparation of the skin was to shave it after the dog was anesthetized, cleansing with alcohol, followed by the liberal use of iodine. In the entire series we only had two primary infections.

We owe our appreciation and thanks to Dr. M. B. Weston for valuable assistance and administering of the anesthetics, at which he is an expert.

CONCLUSIONS

1. We were unable in any experiment to reproduce bone from free periosteal transplants into the subcutaneous tissue and muscle.

2. We were unable to reproduce bone in the periosteal flap raised, left in contact with the bone, passed through muscle and again contacted with periosteum, with the one single exception where there was a small nodule of bone formed apparently in the free end of the flap, corresponding to another nodule formed on the shaft of the bone opposite, leading us to believe that the bone in the tip of the free periosteal flap was osteoblasts raised from the corresponding area on the shaft of the bone and also because no bone had formed anywhere else in the flap.

3. We were unable to reproduce bone in any experiment from free bone transplants, without periosteum, into the subcutaneous tissue and muscle, regardless of the age of the transplant. Absorption was the rule in every case.

4. We were unable to reproduce bone in a single experiment where bone was transplanted free, periosteum left intact, into the muscle or subcutaneous tissue. These transplants were uniformly absorbed.

5. We were uniformly able to reproduce bone when transplanted and contacted with

living bone, if it were in position where it had a function to perform except experiment, ²² where transplant was only 9 days old.

6 Other necessary conditions being present for its reproduction bone reproduces bone without the aid of periosteum

7 Our transplants that were contacted with living bone and had no function to perform were inclined to absorption.

8 While periosteum may be an aid to the life and growth of bone, we were not able to prove in any experiment that it was at all essential

FACTORS INFLUENCING THE MORTALITY OF SUPRAPUBIC PROSTATECTOMY

By HUGH CABOT M. D. BOSTON

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MUCH as I should like to hold a contrary view I still believe that the operation of suprapubic prostatectomy has a higher mortality as at present performed than when the operation is done by the perineal route. The high operation is I believe far more efficient and for this reason we might be willing to accept a higher risk, but not until it appears that we have reduced the mortality to the lowest possible figure compatible with efficient work. There are three factors which contribute most importantly to the mortality of operation and to these I would direct your attention. These are the anæsthetic, the shock, entirely apart from bleeding and the bleeding itself.

Choice of anæsthetics For practical purposes in this country the choice of anæsthetics is limited to three at the present time. Ether gas and oxygen and spinal anæsthesia. Perhaps because I come from the birthplace of ether I have learned to dread it as an anæsthetic for people past middle life. We have been in the habit of falling back upon the very flattering statistics of ether anæsthesia because we have been far too prone to deal only with immediate mortality. It is no new conception to you that the danger from ether is largely in its tendency to irritate the mucous membrane of the lung. Patients requiring prostatectomy are peculiarly likely to have lung conditions likely to resent irritation, particularly chronic bronchitis, emphy-

sema, or even moderate oedema of the bases. If we add in as part of the mortality of the anæsthetic the cases which ultimately die from acute bronchitis, bronchial pneumonia, or even frank pneumonia after prostatectomy I believe that we shall inevitably come to regard ether as not the safest but probably the most dangerous of general anæsthetics.

Gas and oxygen Of late years the advance in our ability to manage gas and oxygen has increased enormously and it is now among the most valuable at our disposal. It has however certain perfectly distinct disadvantages when applied to this class of cases. It is not a safe anæsthetic for patients with diseased hearts and these are admittedly common in this class of patient. Moreover the mere mechanical difficulties of administration to these lantern-jawed, full bearded people is by no means inconsiderable and these objections to my mind go far to vitiate its value as the anæsthetic of election.

Spinal anæsthesia There can be no question that this method of anæsthesia is the ideal one if we come to believe that it is as safe or safer than those with which it must be compared. It obviously removes the dangers attendant upon general anæsthesia in patients with damaged hearts or lungs and we have no reason for believing that it exerts an unfavorable influence upon the action of the kidney. We come down, therefore directly to the question of the risk. I believe that statistics are now at hand from reliable

sources extending over a term of years to show that this method of anesthesia carries no considerable danger. I have been unable to find evidence that the mortality is more than one in a thousand but even if we were to admit a mortality of one in five hundred it would still have a long lead over any form of general anesthesia. Looked at purely from its anesthetic qualities I believe it to be no more dangerous than the other anesthetics and for reasons which will shortly appear I think it to have commanding advantages.

Shock. In any discussion of shock we should I think, sharply distinguish the shock which arises from trauma and that which appears in connection with loss of blood. At this point I desire to confine the word shock to that which has no relation to bleeding. It seems to me clear that the shock of the suprapubic prostatectomy is considerably greater than that of the perineal operation, done with equal skill. This must be due to damage to nerve endings to the tissues traversed by the operation and therefore chiefly to the tissues of the abdominal wall and of the bladder wall itself. It is not clear to me why the manipulation of the prostate whether from above or below should be essentially different in this regard though there is some evidence to show that such is the case. The work of Critt in the elimination of shock, and the late results of shock I doubtless familiar to all and his method of operating under what he has called anoci-association has been widely discussed. The soundness of his general conclusions seem to me so clear as to be convincing and I have for a considerable time adopted his technique in all abdominal operation but this technique does not seem to me thoroughly applicable to operations upon the prostate. I have not been able by his method to obtain efficient block of the structures in the neighborhood of the prostate and it has not seemed to me that the anesthesia of the bladder wall was complete. The only absolutely satisfactory method of completely blocking nerve stimulus from this region is spinal anesthesia and since I have employed this as a routine measure for all operations upon the prostate the elimination of shock has seemed to me absolute. These

patients go through operation without change in the character of the pulse and I have been unable to see that the operation had any effect upon their nervous mechanism.

If the observation of others bears out this view it will go far to clinch the supremacy of spinal anesthesia for these operations.

Bleeding. It has of course been generally recognized that the control of bleeding was an important factor in the success of operation and yet I do not think that recognition has been as complete as the situation requires. We have been too likely to be satisfied with control of bleeding to such an extent that it did not obviously cause the death of the patient and have not been sufficiently alive to the fact that loss of blood is a factor in mortality through its ability to lower general resistance. The ability of these patients to successfully withstand operation rests upon a very delicately balanced mechanism and any extra load thrown upon them from any source may tip the scale. Infection in one form or another is an important factor and this at the last analysis depends far more upon lowered resistance than upon the actual contact of bacteria with raw surfaces. We have taken considerable trouble to avoid the more gross forms of wound infection and have planned our operations with this in view overlooking the fact that the resistance of the patient is a far more important factor. More and more I have been impressed with the fact that if we avoid disturbing the balance of the protective mechanisms which guard the patient against infection through faulty management of anesthetics, prolonged traumatic operations and loss of blood, it matters little by what precise technique we achieve the result. These patients may be compared in regard to their ability to lose blood, to children in whom we recognize the fact that operation must be done "as dry as possible." I wish therefore to discuss in detail the method of controlling bleeding because they do not seem to me to have been as efficient as the situation requires.

Local methods of controlling bleeding. A very considerable number of operators by the suprapubic route cannot properly be said to take any method of controlling the bleeding

and are content with the uncertain contractility of the structures from which the masses have been removed and the formation of thrombi in the veins. This method, or lack of method seems to me altogether too haphazard and if we believe that loss of blood should be reduced to a minimum we cannot assent to this method of trusting to the unknown abilities of the individual patient. Next in order of frequency probably comes the use of irrigations, either hot or cold, either constant or intermittent. This method appears to me no great improvement over nothing for while it undoubtedly has a tendency to check bleeding partly by the actual temperature of the irrigating fluid and partly by keeping the bladder free from clots, which will cause dangerous distention, it is altogether too inaccurate to stand the demands of a scientific surgical procedure. Although with its use most patients will recover some patients will be lost through actual loss of blood or the more elusive results of bleeding commonly put down in the records as sepsis pneumonia, or other form of infection.

Packing. A more accurate and certain method of control is to be found in the use of gauze packing in various forms. A considerable variety of methods have been employed, all more or less efficient. The older and more crude method of packing gauze directly into the cavity and bringing it out through the wound without providing other drainage of the bladder is open to the great objection that it leaves the patient constantly wet and exposes the freshly traumatized tissues to the contact of more or less infected urine. It is an unnecessarily crude method. The better method is that employed by Mitchell, Davis, and others of using a long narrow strip of gauze which is then brought out through a good-sized suprapubic tube either metal (Davis) or rubber around which the bladder wall can be closed snugly and the wound kept dry. In due time the gauze is removed through this tube without disturbing the drainage of the bladder. This is to my mind the most efficient method of packing and would be that of election except for the fact that packing seems to me objectionable no matter how well done. Packing necessarily

means tissue necrosis. Tissue necrosis invites infection and infection is on the whole the largest factor in mortality. If the bleeding can be controlled in no other way then packing must be the choice but I am firmly of the opinion that it can be efficiently controlled by far better means and upon a more accurate knowledge of the sources of this bleeding will depend our ability to control it.

Sources of bleeding. It has I think generally been assumed that the important bleeding came from the veins lying in the sheath of the prostate, the so-called periprostatic plexus. It has been too little recognized that the most important bleeding was arterial and not venous, important because more difficult to manage. With a larger incision in the bladder wall, which it has been my habit to employ during the last year ample opportunity has been given of seeing exactly where the blood comes from and I have been surprised to note that it came largely from the upper portion of the wound where the masses were separated from the muscular structures of the bladder neck. There are often good-sized spurs coming from just beneath the torn mucous membrane at the bladder neck and the amount of actual bleeding from the cavity has been comparatively small. With these facts in view I have come to believe that some form of suture will be found the most efficient method of controlling bleeding and I have employed a considerable variety with a more or less measure of success.

Methods of applying sutures to the neck of the bladder. In order that this may be done with any efficiency a much freer incision in the bladder wall is necessary than has been customary in the past. In other words, a thoroughly good exposure of the field must be had. It will be objected that this unnecessarily prolongs the time of operation and increases the trauma of the operation. To this it may be answered that under spinal anesthesia time is comparatively cheap as the patient is subject to no strain and the difference of ten or fifteen minutes in the length of an operation is I believe negligible. Moreover the shortness of many of the

operations in which enucleation is done through a small suprapubic incision is more apparent than real, because when the patient is returned to bed the operation is not in any proper sense finished. Bleeding is still going on often of a considerable amount which is depriving the patient of that which he needs, his blood to a far greater extent than would a moderate continuance of the operation resulting in a dry wound. Our ideal in these cases should be to get the bladder so dry that we could close it without drainage though I believe such a closure to be in the highest degree unwise. A good exposure of the bladder must be obtained. The masses are then removed by enucleation and with retractors in the bladder and the foot of the table more or less elevated the source of bleeding is sought for. As I have already pointed out, this comes in considerable part from the bladder neck and to this region sutures should be applied. I have not been able to make any efficient application of sutures to the walls of the cavity with a view to its obliteration and incline to regard this as anatomically impossible owing to the fixed relation of the lateral wall to the pubic arch. I have however gotten efficient control of bleeding by whipping with a catgut suture what may be termed the neck of the bladder. This may be done by carrying a small, rather full, curved needle down into the cavity from which the prostate has been removed and bringing it out through the lateral wall close to the pubic bone on one side or the other including all the muscular structures of this region. In this way a considerable bite of tissue is obtained. The suture is then carried toward the floor of the bladder as a continuous suture and is stopped just short of the middle line. The same procedure is carried out on the opposite side thus to a greater or less extent puckering up the bladder

neck. In some cases where there is considerable laxity of the tissue this puckering will result in more or less diaphragm formation. When this occurs the diaphragm should be cut through on the floor either with scissors or the cautery and any bleeding resulting from this maneuver controlled either with suture or cautery. The result of this suture is to considerably narrow the bladder neck, at the same time giving free drainage on the floor at the lowest point. What is far more important as a result, is that the bleeding is efficiently controlled and no packing is required. Further experience is necessary to simplify the method and it may well appear that some other plan of applying sutures will be better. I am not wedded to this or any other particular method, but am much impressed with the efficiency of suture in some form and regard it as the most certain method of controlling what I am convinced is the most important factor in mortality. The operation is finished by the closure of the bladder wall by suture around a medium sized drainage tube and it has been our custom to leave an indwelling catheter in the urethra through which the bladder could be irrigated both for the purpose of accurate knowledge of the amount of bleeding and to prevent absorption in cases where the bladder is seriously infected.

In closing I want to urge strongly the importance of paying attention to the three important factors at present influencing the mortality of suprapubic prostatectomy the anesthetic, the production of shock by traumatic operating, and the inefficient control of bleeding. When these factors are reduced to a minimum as sources of danger, suprapubic prostatectomy will be the method of election for all cases of adenomatous enlargement of the prostate, and the perineal operation will have passed quietly into history.

THE EARLY DIAGNOSIS OF CANCER OF THE OESOPHAGUS¹

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STATISTICS prove that cancer of the oesophagus is a frequent disease. Like other cancers of the gastro-intestinal tract it has three stages of development. In its first stage it is simply a disease of the mucous membrane a polypous growth in the wall of the oesophagus that protrudes into its lumen, or else an ulcerating infiltration which gradually involves the submucosa and the thin muscular coat. Symptoms of stricture are still absent, but there may already be difficulty in swallowing and on account of change of food loss of weight. When the cancer in its growth has encircled the oesophagus, constricting its lumen the second stage has been entered upon. The difficulty in swallowing becomes more pronounced submucosa and muscularis have become thoroughly infiltrated, unelastic and unyielding but still the cancer is confined to the oesophagus proper although some of the lymphatic glands may have become involved. The third stage sets in with the reaching out of the growth beyond the walls of the tube, its becoming adherent to the neighboring organs e.g. the aorta, bronchus lung, etc. and particularly to the pneumogastric nerves.

Clinically this carcinoma is the most benign of all occurring in the entire gastro-intestinal tract. It remains locally confined for a comparatively long time, infects the glands at a late period and metastases appear only in the advanced stage.

If treated palliatively the time between first symptoms and exitus is ordinarily from twelve to fifteen months.

If treated radically our real hope for a successful issue lies in our getting the chance to operate during the first stage and our most energetic efforts should be exerted and directed toward impressing upon the medical fraternity as well as upon the laity the danger of temporizing with an impediment between mouth and stomach and the urgent necessity

in such cases, of promptly establishing a strict diagnosis.

If a patient presents himself with the complaint that he has difficulty in swallowing or that he regurgitates part or all the food he swallows, the following affections may be present: diverticulum of the oesophagus; cardiospasm; narrowing of the lumen of the oesophagus by pressure from without (swollen glands; aneurism tumor of the mediastinum exudate within the pericardium); cicatricial stricture due to swallowing of a caustic, the rarer strictures following tubercular or specific ulcerations or a peptic ulcer at the cardia, finally cancer.

As to frequency the rotation is reversed cancer standing at the head of the list.

The means of making the differential diagnosis, next to a most careful clinical examination are sounding, oesophagoscopy, radiography with fluoroscopy and exploratory thoracotomy.

I. SOUNDS

A modern oesophageal sound should be part of the equipment of every physician a very commendable one is that devised by Callmann originally designed for examination of the rectum. The usually employed olive sounds demonstrate the existence, location and degree of the stenosis but fail to indicate its length. A steel rod with mushroom tip so shaped that it will not cause pain if moved downward or upward, has proven very practical. (Fig. 1a.) Callmann found that the oesophagus from pharynx to cardia if normal, gives to the fingers guiding the sound the impression of a soft smooth and elastic surface the mucous membrane closes in upon the head of the sound and thus is palpated direct. Wherever the tissue is changed by either benign or malignant causes an uneven surface is felt. Therefore, when difficulty in swallowing exists but the oesophageal wall

Diescher med. Wschrhft., 1901 p. 499.

¹Read before the author's annual meeting of the American Gastro-Enterological Association, Washington, D. C., May 3, 1902.

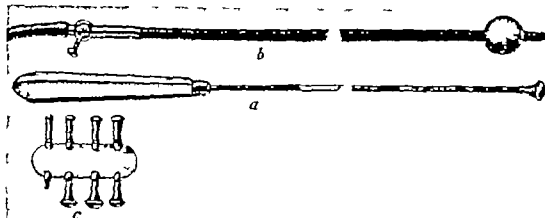


Fig. (a) Callmann's esophageal sound with mushroom tip. (b) Schreiber's esophageal sound for retrograde exploration. The collapsed bulb is filled with water after it has reached the stomach. (c) Interchangeable tips for Callmann's sound, representing sizes 15 to 30, French gauge, the increase being 3 millimeters each.

feels even and smooth in its entire length there is probably no cancer present.

This sound is especially advised for use in nervous patients where it is difficult to distinguish between spastic and neoplastic stenosis further where the organic stenosis is accompanied by spasms of the muscularis the symptoms of the latter overshadowing those of the former finally in the initial stage of cancer where there is no pronounced stricture.

As regards the cardia it should be noted that the healthy cardia is frequently passed with a slight jerk.

Another very good sound is that of Schreiber. It is built for retrograde exploration and gives reliable information of a stenosis which it would be hard to detect by the ordinary sound. It is a rubber sound to which a small bulb is attached (Fig. 1b). After introduction into the stomach, water is filled into the bulb thus distended, it is slowly pulled upward and moves smoothly where the esophagus is normal. Diseased spots arrest its passage and hold it so tightly that even quite a strong pull will not budge it. Schreiber found that from 80 to 90 per cent of all the stenoses he examined were of cancerous nature, spasm being the least frequent cause of stenosis in the remaining 10-20 per cent.

These sounds have been dwelt upon somewhat at length, because they can be made use of by every physician. Other methods of examination are esophagoscopy with extirpation of a small piece for microscopic examination, radiography with fluoroscopy and exploratory thoracotomy. Esophagoscopy and radiography are best done by the specialist, or at institutions. Highly important and absolutely indispensable though they be, they are here not specially considered although, as regards radiography a proposition lately made by Basler² of New York, should be briefly mentioned. He makes use of a special sound, with rubber bulb at its end which, after being introduced into the stomach, is distended and pulled into the cardia. It occludes the latter and permits the bismuth meal to stay within the esophagus. He believes that pathologic changes within the tube will thus be recognized in the very early stage of the trouble. The idea seems to be a good one and it would certainly be highly gratifying if its practicability could be successfully demonstrated in the near future. It would mean a great enhancement of the diagnostic value of the X-rays in this class of cases.

² The question, whether the removal of parts of the tumor for microscopic examination, on absolute necessity before thoracotomy, can be advised, as most surgeons distrust it, still under discussion. Forasmuch as Basler found Basler's tube, who considers this preliminary measure entirely superfluous, and whose directly diagnostic, no longer preliminary (the esophagus with posterior mediastinum). (München. med. Wochenschr. 1911, No. 29, 2139.)

Read. Med. Wochenschr. 1911, No. 27. Schreiber's as well as Callmann's sound were presented before the Association.

Exploratory thoracotomy takes the same place in the surgery of the thorax as exploratory laparotomy does in abdominal surgery. It has been definitely proven that under differential pressure it can be carried out with the same amount of safety as the latter.

The principal point of the whole question is, that a patient who complains of difficulty in swallowing must, by mutual consent of physician and surgeon be considered a serious case a case that may need prompt radical surgical treatment as his only chance *agros salus prima leat!* As soon as the physician has become suspicious of an oesophageal stenosis, he should insist on a strict diagnosis, and if carcinoma is found the case is a surgical one. If doubt remains exploratory thoracotomy is clearly indicated and the surgeon must be prepared to do radical work, in case malignant disease be found.

It is true death may come more quickly if the patient submits to radical operation but it will also inevitably come within a few months under general treatment. On the other hand, under surgical treatment, death may not come at all the patient may emerge from the operation with the ability of swallowing restored and in condition to again enjoy life and go about his daily work. Proof for this assertion are the following cases.

Sauerbruch a few years ago had a patient who lived fourteen days after resection of the oesophagus and oesophago-gastrostomy by means of the button the man then died of acute pneumonia of the right lower lobe.

Last year Ach had a patient recover after resection of the oesophagus for cancer in its lower third, but also had the hard luck to see him succumb owing to insufficiency of the gastric fistula. He died on the seventeenth day after operation.

Within the last twelve months the surgery of cancer of the oesophagus has progressed at a tremendous pace. In the course of the first ten weeks of 1913 two patients have entirely recovered from the operation. Zaaijer of the University of Leiden, Holland, successfully resected a cancer of the cardia which involved the lower portion of the oesophagus

and cardia (1913 Jan 13)² and Torek of the German Hospital of New York successfully resected a cancer situated behind the aortic arch (1913 March 14)⁴ Both were early cases. In both the pneumogastric nerves could be dissected off the tumor.

These successes are truly inspiring for now at last the proof has been rendered that such patients have a chance nay even a good chance, to pull through *if they reach the surgeon early* and furthermore, that tumors not only in the lower third but situated in any portion of the oesophagus are amenable to resection with fair hope of success.

Incidentally the operation for constructing a new tube through which the patient may swallow has been greatly advanced. Jianu's method of gastrostomy devised in 1912 in which the major curvature of the stomach is used for the formation of a tube representing the lower part of a new oesophagus, has become a firmly established operation. The free end of this tube can be nicely pulled up extra thoracically to the level of the third if not second left costal cartilage. When thereupon in the second sitting the oesophageal growth within the thorax is resected the oral stump is no longer inverted and left *in situ* but transposed outside under the skin of the thorax. For this purpose an incision is made down to the oesophagus above the clavicle. If the ends of these tubes the one pulled up from below and the other one pulled down from above, meet they may at once be united if they are short a rubber tube according to the Gluck Perthes method may be employed for their connection or a skin plasty will complete the extra thoracic oesophagoplasty.

It even seems possible according to our experience in experimental surgery to make use of this Jianu tube for intrathoracic oesophagoplasty when the seat of the tumor is in the lower third by pulling it up alongside the cardia — which was closed by sutures in the course of the resection — into the thorax and there have it replace the removed lower third of the oesophagus. The same of

² Beitr. Klin. Chir. Intern., 479.

⁴ Ann. N. Y. Acad. Sci. p. 113.

Three patients, recently operated upon by me according to this method, have given very satisfactory result.

³Verh. d. Schmeisser Techn. der Thorax-Chirurgie, p. 4.
Ach, Beitr. Oesophagus-Chir. 14 p. 64, etc.

course, applied if the cardia as such was involved with the adjacent parts of the lowest portion of the oesophagus.

In cases in which the cardial portion of the stomach has been encroached upon by the malignant tumor at the cardia, Jann's tube could hardly be made long enough without getting too close to the affected field. For such cases, v Fink's proposition recently brought out,¹ to make use of the entire stomach inclusive of the horizontal portion of the duodenum for the inferior oesophagoplasty would come into consideration. The stomach

and proximal end of the duodenum, properly mobilized, can be pulled up nearly to the clavicle and later united with the transposed proximal oesophageal stump. An additional posterior gastro-enterostomy takes care of the proper passage of the food swallowed through the new extra-thoracic oesophagus.

Thus we can now claim to be able, in an early case not only to remove the malignant tumor from any portion of the oesophagus, with reasonable hope of success, but may at the same time fulfill the wish, which, next to life is the most ardent one of these patients—to give them back the ability to swallow

Zentralbl. f. Chir. 1913 April 10

RENAL FUNCTION

By R. S. BARRINGER, M. D. New York City

FROM 12½ to 25 per cent of all operative deaths following nephrectomy are due to renal insufficiency to an improper estimation of the reserve force of the remaining kidney. In a certain number of cases the kidney function as measured by our present tests and particularly phenolsulphonephthalein, varies with the destruction of the kidney tissue. The higher the output of phthalein the better is the kidney able to withstand nephrectomy of its fellow. In certain other cases there occurs what might be termed "sports" in which a kidney of normal or practically normal function as estimated by phthalein, by urea or by any other known test, utterly refuses to bear out these tests and the patient dies anuric. As far as one can judge the deaths in this latter class exceed those in the former. The following cases are instances. Cabot reports a case in which the normal kidney excreted 36 per cent of phthalein in an hour. Its diseased fellow kidney was removed and the patient died of renal insufficiency. The kidney that failed was normal and hypertrophied. Asakura in 70 nephrectomies had

four operative deaths, one of which was due to anuria. According to indigo-carmin excretion and the cystoscopy the kidney that failed was considered to be normal in function. Some years ago before the days of phthalein, I saw a case that could not be cystoscoped because of an irritable urethra. Nephrotomy on one side and decapsulation on the other was performed. The operation was unduly long. Neither kidney showed any gross abnormality. The patient died anuric, yet neither kidney was removed and operations which are often done for the very relief of anuria had been performed.

I believe that neither the progressively decreasing output of phthalein suggested by Geraghty nor any other known test, will give any index to the occurrence of these cases. A modified reverse of Beer's and Alexandri's conclusions as to the value of phloridzin—that, while it is of value when positive, it is of no value when negative—can be said of all renal tests, and especially of phthalein. That is *Positive and sufficient phthalein excretion does not preclude the possibility of death from renal failure*.

There are four other points which I wish briefly to consider in estimating renal function

¹Transl. of Test of Renal Function. Tr. Am. Ass. Genito-Urin. Surg. Club. 1912. Klin. Wochenschr., Deutsche Gesellschaft f. Urol., Sept. 1911.

First, variations of phthalein in normal cases. In 25 cases (nearly all intravenous phthalein) the average time of collection of phthalein after its appearance was about 15 minutes. In almost one half of these cases the time of collection was but 5 minutes. Some variations of excretion are due to this short period of collection. I believe, however, that if urine runs from either catheter freely a diagnosis can be made in most cases in such a short period. If there is one thing more than any other which has brought cystoscopy into disrepute it is the old time nerve racking sessions. Slight inaccuracies of diagnosis are better than leaving the impression that cystoscopy is a major operation. Likewise with very rare exceptions cystoscopy should be a one-step procedure.

In these 25 cases, which from the phthalein and urea excretion the microscopical and other examinations I have every reason to believe were normal, the shortest time of appearance of red after intravenous injection was three minutes the longest 12 minutes. The greatest variations in the excretion of the two were in proportion of 2 to 1 on one side an excretion of 10 and the other 21 per cent.

As a fair guide to normal excretion after intravenous injection Keyes gives the terse formula, "1 per cent in 1 minute for 1 kidney." In one of my cases 30 per cent was excreted in 8 minutes. The lowest excretion was 10 per cent in 15 minutes. In one ureter catheterism case in which the urine flowed freely there was no red excreted for 20 minutes after an intramuscular injection. In line with this instrumental inhibition I have seen a case of bilateral nephritis with one kidney as good as the other in which for a half hour no urine at all came from one kidney while urine dropped constantly from its fellow. In most cases after intramuscular and intravenous injection the greater part of phthalein comes down in the first hour. In entirely normal cases this may be reversed. In a case of unilateral kidney bleeding due to hemophilia 9½ per cent came down in the first hour and 46½ per cent in the second. The ratio of red excretion in a given time respectively after intravenous and intramuscular injection, is usually about 2 to 1.

Second the individual "dead line." Every death from suppression of urine following a nephrectomy is said to be due to the inability of the remaining kidney to sustain life. The immediate cause of death in such a case is the operation the anesthetic, the surgeon's manipulations or both. Because of the varying technical skill of different surgeons, any general measure of functional capacity must be modified to accord with the surgeon that is to operate. In other words if the one surgeon places his dead line at a certain percentage of excretion this dead line may not at all apply to a second surgeon whose mode of operation may vary considerably from that of the first. To establish such a personal dead line, such a low limit of excretion of either normal or introduced substances one must have had at least one patient die of renal insufficiency. This death will establish a low limit of excretion which if approached in any other case will preclude nephrectomy. It is possible that the low limit of excretion of both kidneys as observed in cases of prostatectomy might apply to a single kidney in cases in which nephrectomy is the operation.

In 50 normal and abnormal kidney cases in which phthalein was used I have learned nothing of the renal function and of the practical value of phthalein in estimating the renal function. In none of these cases was there enough disease to seriously impair the function of the remaining kidney. In other words, in the 50 consecutive cases one kidney never varied seriously from normal function. This indicates how difficult it is to get enough cases upon which to base any deductions as to the value of any renal function tests.

Third urea and phthalein. The estimate of the urea percentage and the urea volume (the latter is of more value) is a necessary and valuable adjunct to the information given by phthalein, not so much to tell us of renal function for the urea excretion from one kidney tells us nothing of its function, but as an aid to diagnosis.

Fourth, value of estimating the total destruction of the kidney. Five years ago in speaking of the urea excretion I said that with the total urea excretion from the diseased kid-

ney less than one fourth of that excreted by its fellow such a kidney is practically destroyed. This estimation was arrived at by examining the reports of a number of cases in which nephrectomy had been done. The value of this seems to be twofold. First it is of worth to know if a kidney is practically useless and has practically very little or no use left—because then a surgeon will have less compunction about removing it if the diagnosis of the cause of the disease is in question. Second it would seem if one kidney were entirely destroyed and if the other kidney had taken up the total excretory work, had hypertrophied this case would be less likely to be one of the class of sports spoken of above. This class of cases should be furthest removed from the possibility of death from renal failure. In making this equation either urea percentage urea volume or phthalein may

be used. I believe however that the urea volume gives more accurate results than either of the others.

SUMMARY

Phthalein is the best single drug for the estimation of the kidney function. The amount of phthalein excreted varies with the destruction of kidney tissue and generally but not always with the functional capacity of the kidneys. Because of the variations in its excretion phthalein should be used in conjunction with the urea excretion not to estimate the kidney function directly but to estimate the comparative work of the two kidneys. If the urea volume of the diseased kidney is less than one fourth of that excreted by its fellow that kidney is practically destroyed. In certain cases no known test of renal function can foretell the death from anuria that follows operation.

AN OVARIAN PREGNANCY LOCATED IN THE GRAAFIAN FOLLICLE

BY FRANKLIN P. MALL, M. D. B. THOMAS

AND

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From the Anatomical Laboratory of Johns Hopkins University

THE following unusual specimen is reported because it is not only of interest to the surgeon, but also to the embryologist. The diagnosis was difficult on account of the misleading statements of the patient. It is of great scientific value for the specimen shows conclusively that the ovum had lodged itself in the Graafian follicle undoubtedly in the one from which it came indicating that the sperm must have entered the follicle after it had ruptured. The fertilized ovum then found lodgment in the follicle around which the corpus luteum developed. As in other cases which have been reported no decidua was formed showing that the decidua is not of embryonic origin.

The specimen illustrates well the advantage of co-operation in research. Under a different

organization with a properly equipped laboratory attached to a surgical clinic, specimens of great scientific value may be recognized and properly reported but it is not necessary to have an entire medical faculty attached to each clinical laboratory in order to make progress in medical biological science.

This specimen has passed through a number of hands, and in part this publication rests upon the following original records:

No. 26035 Surgery Johns Hopkins Hospital.

No. 15085 Gynecological-Pathology Johns Hopkins Hospital.

The publication of similar specimens by Bryan Toucher and Kent (Contributions to the study of the early development of the embryonic of the human ovum, cited by the Carnegie Trust of the Scottish Universities, Glasgow, 1907) shows a similar co-operation. Have there experts, the embryologist, the pathologist, and the obstetrician joined to describe an early ovarian pregnancy?

With the aid of the Foundation in Art as Applied to Medicine, Johns Hopkins University and the Carnegie Institution, Washington, D. C.

No 550 Embryological Collection Johns Hopkins University

Surgical patient No. 26035 age twenty-four years was admitted to the Johns Hopkins Hospital June 1 1901 with the diagnosis of appendicitis, and was operated upon by Dr. Finney June 3 1901.

The clinical history, taken on June 1st is as follows. When admitted to the ward the patient was not complaining of acute pain, but only of general soreness in the abdomen. There were paroxysms of pain, general throughout the abdomen, with intermissions in which she was somewhat more comfortable. With difficulty the pain was localized in both the left and right sides of the abdomen.

When examined by Dr. Finney, general soreness of abdomen was found, the pain being more cut along the left side shooting up to the right shoulder. The pain had not changed in character or intensity. There were sharp attacks of pain especially in the left side when the patient tried to move. There was also difficulty in breathing.

During the afternoon the condition of the patient was very uncomfortable with repetitions of the symptoms just given. The pains became more acute after taking ice. A renewed onset occurred at 7 P.M. and this continued with some nausea and occasional vomiting.

The pain had been sharp (not crampy) and had apparently gone up under the right C.M. in the morning. There had been pain also under the shoulder. The patient said she had never had any similar previous attack, and was not constipated previous to this one.

June 3d the patient said she had similar attack of abdominal pain three years ago. This was general at first and finally became more pronounced at the right side, accompanied by nausea and vomiting. From this attack she did not recover entirely for ten days. She had similar but milder attack several months later.

Dr. Finney writes. When I saw the patient I did not think it was appendicitis but the history of similar attacks, which I had reason to believe, after wards were fictitious and the patient mistook symptoms as to the subjective signs together with the fact that the patient was unmarried, misled us as to the true diagnosis. Upon opening the abdomen, however it was found to be filled with blood. At once the diagnosis was clear. I looked for the tubes, but found both intact. The right ovary was the point of bleeding. It was swollen and appeared as you found it in the specimen. The whole process was so definitely confined to the ovary that it seemed, clinically to be a definite case of ovarian pregnancy.

The patient made speedy recovery and was discharged on June 20th.

The specimen was sent to the Gynecological-Pathological Laboratory to be examined and the following record was made

The specimen consists of a tube and ovary from the right side. The tube at its outer extremity has been considerably mutilated. The portion received measures six centimeters in length and is somewhat tortuous. It shows a few adhesions on the surface. Section through the middle portion of the tube shows the mucosa to be somewhat thickened and blood-tinged. Section through the distal portion gives a similar picture. There is no gross evidence of an extra-uterine pregnancy. There is a portion of the fimbria present, but the portion of the tube between this and the middle is missing. There is nothing to suggest placental tissue. The mucosa appears normal in the sections.

The ovary measures 5 x 4 x 3 1/4 centimeters. The surface shows a few old adhesions. On section the ovary shows a cyst three centimeters in diameter. Clinging to the wall and bulging into the cavity is a blood clot two centimeters in width and eight millimeters in thickness. This on section appears to be a corpus luteum. It is intimately connected with the walls of the cystic space. Further sections show villi in the clot attached to inner surface of the space in the ovary. The appearance of the specimen with a section through the ovary is shown beautifully (Figs. 1 and 2).

When the specimen was added to the embryological collection in the Anatomical Laboratory there came with it several sections from the Gynecological Pathological Laboratory and two drawings (Figs. 1 and 2) by Professor Brödel. These sections included the chorion ovary and uterine tube. The sections of the uterine tube appear normal with a very extensive unfolding of mucous membrane and occasional lymph nodes within it. Doubtless the sections are from the distal or fimbriated end of the tube. The sections from the chorion are apparently at right angles to its main wall as shown in the figure.

The villi which are irregular in arrangement, show attachment to the main wall of the chorion, while at their distal ends they in variably butt up against the blood clot (Fig. 6). In no instance is there any sign of the decidua nor do the sections containing the

villi contain any portion of the adjacent ovarian tissue. The blood clot is well organized with strands of fibrin extending in all directions and without distinct red blood corpuscles. Most of the villi have a fibrous mesenchyme in some it is mucoid. Scattered through the mesenchyme of the chorion there are blood islands or rather groups of blood cells within the blood vessels from the embryo. They are especially numerous where the villi are attached to the main wall of the chorion, showing that in its development the embryo must have been present at an earlier stage. The distal ends of the villi are apparently covered with a double layer of epithelial cells which is as should be in normal development, however a rich peripheral trophoblast is missing. In the trophoblast there are numerous small masses of disintegrating cells. These appear to be pretty well intermingled with mesenchyme cells at the tips of the villi as shown in the figure. Many polymorphonuclear leucocytes are present where the trophoblast comes in contact with the blood clot. Among the leucocytes there are isolated cells of the trophoblast. At points the isolated cells are also embedded in the mesenchyme of the villi. Altogether these processes are quite identical with those found in the villi of the uterine moles, where there is also every indication of degeneration of the villi and their trophoblast due to either faulty implantation or to infection. In none of the sections is there any indication of the embryonic mass, nor do the sections which were sent show the character of the ovarian tissue adjacent to the clot containing the villi although in a number of sections the chorionic wall is shown to be composed of two layers which doubtless represent both the chorion and the amnion (Fig. 6, *Am* and *Ch*). In one section these two layers are blended for a short distance and at this point there are numerous embryonic blood vessels. The fact that the amnion, which is quite characteristic, is in close apposition with the chorion and the presence of numerous blood islands show quite conclusively that they are identical with an ovum which is sufficiently well advanced in development to contain an embryo about 15 mm. long.

When the specimen came to us, it was composed of two pieces which were formed by cutting directly into the side of the rupture as shown in Figs. 1 and 2. These are drawn natural size and therefore give the dimensions of the ovary. A loose piece of clot was taken out and cut in serial sections, but upon close examination with a microscope no trace of the chorion could be found in any of them so it appears as if we had received only the clot and a small remnant of the chorion attached to it which had possibly invaded the ovarian tissue and lodged itself freely within it. The ovary was then cut into slabs about 5 mm. thick, and at a distance from the cavity containing the villi a large corpus luteum, 10 mm. in diameter entirely filled with blood, came into view (Fig. 3). New sections of the wall of the cavity were then made which show that the cavity as a whole is lined with a smooth grayish membrane barely one half of a millimeter in thickness. In the tissue between the corpus luteum and the main wall of the cavity there is an extravasation of blood which enters a few of the adjacent Graafian follicles. The arrangement of these follicles is well shown in Fig. 2 but the corpus luteum, which is filled with blood, is much nearer the proximate pole of the ovary and is therefore not shown in this section. It is close to the point marked *Adh* (Fig. 1). Sections were then cut through the whole ovary, including the corpus luteum and the blood clot to which the villi are attached. These sections include all of the structures of the ovary and give the entire wall of the cavity containing the ovum. The sections, showing most of the structures are at right angles to the ovary directly through the *O* of the word "Ovary" (Fig. 1). These sections were stained in a great variety of ways: hematoxylin, acid fuchsin, iron hematoxylin, eosin and safranin, Ehrlich's hematoxylin, orange G, and a number of connective tissue stains. In general, they show that the ovary is active and not fibrous, apparently normal, containing numerous blood vessels and a ring of large Graafian follicles (Figs. 2 and 3) with an outside zone of small vesicles containing small ova. To all appearances, this is as it should be in a young individual.

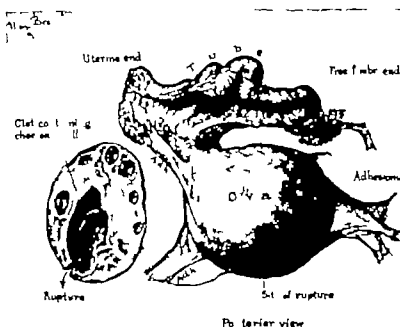


Fig. Posterior view of the ovary and uterine tube before it was cut open.
Adh., adhesions. Reduced one tenth.
 The Transverse section through the ovary at the point of rupture of the follicle from which an ectod. haemorrhage took place is B. The clot is covered with an inverted chorion and contains villi. Reduced one tenth.

The wall of the cavity containing the blood clot and villi is lined almost throughout with a layer of lutein cells (Fig. 5). This layer is quite uniform ranging from one half to one millimeter in thickness. Between the lutein cells there are numerous strands of blood vessels but on their inner side there is a layer of fibrin before the blood clot begins. On the outside, the lutein cells form small islands of more compact cells that stain more intensely in haematoxylin (Fig. 5 C). The section reminds one very much of a section of the adrenal. We have here a layer of lutein cells well spread out possibly due to the distention of its cavity by the ovum and representing the corpus luteum which according to our convention is about as old as the ovum appears to be. In other words, it is clear that the ovum developed within the cavity of the Graafian follicle to which it belongs. The corpus luteum filled with blood near the proximate pole of the ovary (Fig. 4) which at first sight appears to represent the one from which the ovum came is considerably more

advanced in development than the one containing the ovum therefore it belongs, in all probability to a previous ovulation. Had it not been for the additional sets of sections we made it would have been necessary to interpret this specimen as Bryce Kerr and Teacher did theirs. The haemorrhage in the ovary between the older corpus luteum and the cavity containing the ovum could easily be viewed to indicate that the ovum invaded the ovarian tissue as shown by the illustrations of these authors.

The older corpus luteum demonstrates once more very clearly that it is imperative to standardize the development of the corpus luteum anew. It is encircled by a very marked corpus fibrosum which is wavy and forms a uniform sheet about one half millimeter in thickness beyond the blood clot (Figs. 3 and 4). There are few lutein cells within it. On the inner side of the corpus fibrosum there is a thick layer of degenerated blood, and in the center there is a large mass of well defined red blood corpuscles. Within



Fig. 3. Outline of a transverse section through the O in Ovary of FL, showing the clot containing the ovum surrounded by a layer of luteal cells and the adjacent corpus fibrosum. Enlarged nearly two diameters. Cl layer of luteal cells; Bh, blood clot; Cg corpus fibrosum G Graafian follicle.

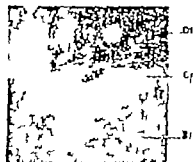


Fig. 4. The small square of the wall of the corpus fibrosum marked in Fig. 3, enlarged seventy diameters. Cl corpus fibrosum Bh blood clot Cl chorion of the ovary.

the very center of the clot there is a cleft which is curiously lined and filled with red corpuscles staining somewhat differently from those of the rest of the clot. Also at the periphery of this clot there is a curious vesicle lying immediately under the outer fibrous layer which may indicate a more recent hemorrhage. At any rate the lutein cells encircling the cavity containing the clot and ovum prove quite conclusively that the ovum did not wander from a distant Graafian vesicle and become implanted freely within the tissue of the ovary. This conclusion has also been

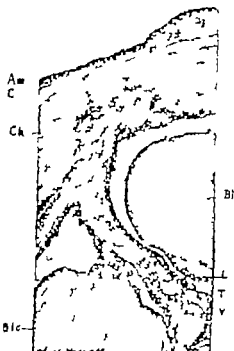


Fig. 5. Section through the transverse of the clot of Fig. 3 showing the wall of the chorion ab villis as bedded in the blood clot. Am The trophoblast T is seen and is intermingled with leucocytes, L. These are also scattered throughout the blood clot. The mesoderm of the chorion, Ch and villi, V are shown. In this portion of the section the amnion Am is bedded with the chorion, but on the left side (left) the chorion, Ca, is outside throughout most of the section.

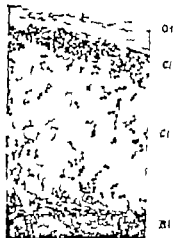


Fig. 6. The small square marked Fig. 5 in Fig. 3, enlarged seventy diameters. Typical luteal cells are shown which form two layers marked Cl and Cg; Cl, chorion of the ovary; Bh, blood clot. Cl chorion fibrosum.

reached by Serebrenikowa¹ in a recent report of a case of ovarian pregnancy which confirms fully that of Van Tussenbroek.

Bryce Kerr and Teacher have recently given an excellent review of the literature on ovarian pregnancy so it is not necessary to repeat it. From another standpoint the subject has been presented by Serebrenikowa. Both of the papers demonstrate that in ovarian pregnancy no decidua is formed showing that the decidua is not of embryonic origin and that it cannot arise from the tissues of the ovary.

Since the cavity containing the ovum in ovarian pregnancy does not always seem to be encased by a layer of lutein cells it is concluded that the ovum either invaded the ovary from its surface or that it burrowed from the Graafian vesicle after fertilization. Undoubtedly the second is the case in the specimen recorded by Bryce, Kerr and Teacher. In it the growing ovum broke through the layer of lutein cells and made for

itself a cavity in the vascular stroma of the ovary. This conclusion could also have been drawn from our specimen had not a second set of sections been made which show that a beautiful and characteristic layer of lutein cells is present. In the first set of sections the wall of the cavity was faulty while the second was perfect. We do not wish to question the accuracy of other observers in this respect we only want to record our own experience. At any rate the possibility of a secondary attachment of the ovum to the ovary through its direct wandering from the Graafian vesicle into the adjacent tissue or indirectly through a reinvagination from the surface of the ovary can not be denied until it is shown that the ovum is invariably lodged in a Graafian vesicle surrounded by a layer of lutein cells of the same age as that of the ovum. Before this is possible it will be necessary to standardize the corpus luteum in relation to the ovum and embryo and also to present as evidence only well preserved specimens of ovarian pregnancy.

Serebrenikowa, Arch. f. Gynak. 91, 1907.

MALIGNANT DISEASE OF THE TESTICLE RETAINED WITHIN THE ABDOMINAL CAVITY

By KENNETH BULKLEY, M. D. NEW YORK CITY

From the Laboratory of Surgical Pathology, Department of Surgery, Columbia University

AS far as I have been able to determine there has never been in the English language a collective study of the literature on the subject of malignant tumors of testicles situated within the abdominal cavity. The most recent collection, which I have been able to find on the subject, was made in France in 1906 by Blanch (7) who collected from the literature 8 cases and added one case of his own making a total of 19 cases. The material on which this paper is based consists of 57 cases collected from the literature and two additional cases hitherto unreported, one of them coming under the writer's personal observation. As the majority of these cases have been reported in the foreign literature I have made brief

synopses of them which will be found at the end of this paper.

The two new cases which I wish to report are as follows:

CASE (History N. 9987 First Surg. Div.)
Male, age 43. Patient was admitted to the Presbyterian Hospital January 9, 1907, with the history that about a month previously he had first noted mass in the left lower abdomen. This mass had not at any time been painful nor had it apparently increased in size since first noticed. There was no history of trauma. His general health has otherwise been good except that for many years he has been moderately constipated and has had more or less indigestion. Patient has been married for many years but though both he and his wife have desired offspring there has never at any time been a sign of pregnancy. The patient has never been examined for the presence of spermatozoa. His wife has been



Fig. 1. Photograph of the gross tumor in vitro. Case showing smooth lobulated character and general contour. The scale reads in centimeters.

examined repeatedly and pronounced normal. As far as the patient knows, none of his forebears have had congenital defect such as harelip, hypospadias, etc.

Examination showed man of medium build, well developed muscularly, nothing in bony framework, facial, or voice suggesting the feminine. The left lower abdomen beneath the rectus was felt mass, smooth rounded, slightly movable, hard not tender apparently about the size of fist. Abdomen as otherwise normal. Penis normal, no hypospadias. Scrotum present but small and above the usual median skin raphe. Testicle as felt either side of scrotum nor in inguinal canals. Inguinal lymph nodes were not enlarged. No other associated congenital deformities found.

Operation as performed January 9, 1910, by Dr. Joseph A. Blake. A 1 inch vertical incision having its center a little below the umbilicus and splitting the left rectus muscle as usual and deepened, opening the peritoneal cavity. Immediately there presented grayish pearly white glistening tumor covered with peritoneum and lying behind the bladder to which it was adherent. The tumor mass was adherent to pedicle about three quarters of 1 inch diameter to the region of the internal ring of the left inguinal canal. The length of the pedicle as about 1 and one half inches. Posterior to the tumor lay the coils of small intestine. Running from the posterior surface of the tumor toward the base of the bladder as the vas deferens. This was divided, the tumor mass was separated from the bladder wall, the pedicle was divided, and an attempt was then made to free the tumor from the small intestine. The union between the two was so firm that this was found impossible and accordingly 6 inch intestinal resection with end-to-end suture as done and the mass removed.

The abdomen was partially closed about a gauze and rubber tissue drain. The right testicle was not seen during operation.

Except for a slight wound infection, the immediate post-operative convalescence was uneventful. About 1 year after operation the patient went through severe typhoid fever successfully and without hemorrhage. At the present time, two years and eight months after operation, he is perfectly well without sign of recurrence. For some months after operation the right testicle at times slipped into the internal ring for the patient would feel dull, aching testicular pain and a mass in the upper part of the canal. This he could reduce by pressure thus relieving the pain. As he has become stronger since operation, this symptom has not troubled him so frequently.

The second case which I report was under the care of the late Dr. McCosh at the Presbyterian Hospital. So far as I can find, it has not been before reported and I now publish it by permission of Dr. Blake.

CASE 2 (History: First Surg. Div. Presbyterian Hospital). The patient was male aged 42, house chief complaint as pain on defecation. This symptom had been present for twenty years, but had been very much worse for the past ten years. Constipation has been marked, bowels moving only at intervals of three to four days. Recently he has noticed that the movements are in the form of hard, scybalous masses.

Examination showed a poorly nourished man. Left testicle in scrotum and apparently normal. Right testicle absent from scrotum and inguinal region. To the right of the median line in the lower abdomen is felt a large hard mass.

Exploratory laparotomy by Dr. McCosh showed large mass adherent to the abdominal wall, rectum, bladder and omentum, and completely filling the pelvis. It was considered inoperable and the abdomen was closed. Patient discharged unimproved, and further history is unknown. Though no sections were taken of this tumor it was considered and classified as sarcoma. In the absence of microscopic section I have classified it under the indeterminate name of cancer.

HISTORY

It has seemed to be for years a surgical superstition that the testicle retained within the abdominal cavity is prone to undergo malignant degeneration. Many of the older writers, Dupuytren (22), Annot (2), Goussier (30), Lecompte (41), Godard (29), Spry (75) mention this possibility all of these writers calling attention to it before Johnson (32) in 1859 put the first case on record.

Godard (29) however had apparently observed cases before this date for he states that in eight monorchids of which he has records, all having sarcoma, seven had sarcoma of the undescended testicle and the eighth a sarcoma of the scrotal testicle. This author does not, however report these cases.

Since Johnson reported his cases, a number of German and French writers have collected series of cases and placed them on record. The literature on the subject is remarkably scarce. Among the papers which should be particularly mentioned are those of Maydl (51) Farwick (26) Eigenbrodt (24) Meiser (53) Kaepfelin (34) Rademacher (65) Szymonowski (78) Chevassu (13) and Blanck (7). The majority of papers other than these contain merely case reports.

That the condition is a surgical rarity will be admitted by all. Bland Sutton (8) in 1910, could find in the museums of the London Hospitals only 14 specimens of malignant undescended testes. He states, "In a few of these cases the testis was retained in the abdomen but in most instances it had entered the inguinal canal."

Kaepfelin (34) says that many of the best known French surgeons have never observed a single case. I can find no cases reported before 1859 and since then have found only 57 in the medical literature of France, Germany, Russia, Italy and the English speaking races. Various statistics are at hand showing the frequency of the condition relative to that of cryptorchidism associated inguinal hernia, malignant testicular tumors in the inguinal canal and malignant scrotal testicles. Marshall (48) examined 10,800 conscripts and found 1 double cryptorchid, 6 left cryptorchids and 5 right cryptorchids. Monod and Terillon (54) found six ectopic testes among 3,600 conscripts. These statistics are probably not reliable as many men knowing of their deformity might not apply for the army. Eccles (23) found among 60,000 male admissions to a general London hospital 38 cases of sarcoma testis. Of these only one was imperfectly descended and that was a left abdominal sarcomatous cryptorchid. Howard (31) found that among 10,000 male patients admitted to a number of the London



Fig. 2. Photograph of reverse side of tumor shown in Fig. 1. At upper portion is seen the resected gut. The prolongation below contains the vas deferens and mass of fibrous tissue in which are found the remains of the pump-handle plexus.

Hospitals during a period of 20 years there were 65 cases of malignant testicular disease or about .06 per cent of all male patients admitted. Of 57 cases with complete histories 9 were in ectopic testicles, 8 of these being in the inguinal canal and 1 just below the external ring. I have looked over the records of 12,729 consecutive male admissions to the Presbyterian Hospital and have found 13 malignant testicular tumors. Of these, 11 were situated in the scrotum and two within the abdomen. Thus in 182,729 male admissions to general hospitals there were three cases of malignant growths of intra-abdominal testicles, or about one in each 60,000 cases.

Eccles (23) reports that of 48,000 males with hernias, 854 had imperfect descent of one or both testes, and that none showed any malignant disease. Coley (15) reports that of 49,859 males with hernias, 400 had imperfect descent of one or more testes. No mention is made of malignancy. Thus in 97,859 male hernias there were 1,254 cases of imperfect descent of one or more testes, or about 1 to 77. None of these are reported as malignant.

Shoedel (quoted by Kaepfelin) encountered 5 cases of cancer of the inguinal testicle as against 36 cases of cancer of the normally placed organ. Odiorne and Simmons (57) reviewed 54 cases of malignant testicular disease from the Massachusetts General Hospital and found that 6 or 11 per cent, were in undescended testes. Of these four were in the abdominal cavity and two in the

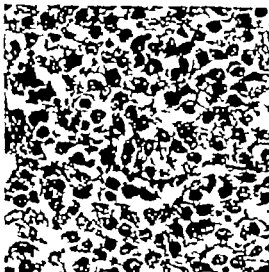


Fig. 3. (450 \times) Micrograph showing an area of the tumor composed chiefly of large polygonal or round cells, apparently pure carcinoma.

Inguinal canal. Cheva su (13) encountered 10 malignant inguinal as against five malignant abdominal testes. Rademacher (65) on the other hand gives the proportion of malignant abdominal to malignant inguinal testicle as 5 to 8. Meiser (53) in 1898 collected 64 malignant inguinal as against four abdominal testes. Blank (7) in 1906 was able to collect 19 cases of abdominal and 93 cases of malignant inguinal testes. Mattioli from the Presbyterian Hospital show 3 cases of malignant abdominal and no case of malignant inguinal testes. Summing up these records we find a proportion of about 1 in 4 cases of malignant disease of the ectopic testicle in which the testicle is situated within the abdominal cavity.

And finally, as to the relative frequency of the condition under discussion, that of scrotal malignant testicular tumor. Cheva su (13) encountered 3 scrotal to 5 abdominal tumors. Odiorne and Simmons (57) found 48 scrotal to 4 abdominal. In my record from the Presbyterian Hospital show 1 malignant scrotal to 2 malignant abdominal testicular tumors. An analysis of these three reports gives the relative frequency of the two conditions as about 1 to 5.

ETIOLOGY

It is not the purpose of this paper to discuss the etiology of the non-descent or mal-descent of the testicle but it may be of interest to briefly note a few facts in regard to this phenomenon.

The genital gland lies at first to the mesial side of and just below the lower pole of the kidney. At the end of the third month the testicle lies in the false pelvis, and by the end of the sixth month close to the abdominal wall at the inguinal ring. The descent from here on is variable. Wrisberg examined 102 male fetuses at term and found 72 had both testicles in the scrotum. In 4 the testicle was in the abdomen. Five had double inguinal testes. Three had one testicle in the abdomen and the other testicle in the inguinal canal. Eighteen were monorchids. Of these there were 5 abdominal and 18 inguinal testicles. It is probable that the majority of these testes would have reached their normal position in the scrotum some time between birth and puberty.

The cause of non-descent has long been a mooted question. The best paper on the subject has probably been written by Eccles

(Quoted by Graham, 1902)



Fig. 4. (400 \times) Another (low) picture of tumor showing markedly imploded chromatin. In other regions of the tumor these cells are so disposed as to suggest small necrotic areas.

(23) who classifies the causes of arrest as follows

1 Conditions associated with the mesorchium.

(a) Mesorchium too long so that testicle hangs too freely in the abdomen and would thus be prevented from engaging in ostium of the processus vaginalis

(b) Adhesions between the peritoneum forming the mesorchium and the adjacent portions of the serous membrane generally the result of intra uterine appendicitis.

(c) Abnormal persistence of the plica vascularia.

2 Conditions associated with the testicle and its component parts.

(a) Vas deferens may be too short

(b) Spermatic vessels may be too short

(c) Epididymis may be abnormal in size

(d) Fusion of the two testes (synorchism)

(e) Certain forms of hermaphroditism

3 Conditions associated with the gubernaculum testis.

(a) Absence of the upper normal attachments of the gubernaculum

(b) Deficiency of its muscular fibers.



Fig 5 (20) Author Case Low power photograph showing the arrangement of peculiar cells described in text. A number of attempts at high power photomicrographs of these cells were made but owing to lack of sufficient detail they are found useless for publication.



Fig 6 (450) Author Case Photograph of portion of capsule of tumor showing edematous connective tissue and atrophic and compressed tubules. No spermatozoa seen

(c) Deficiency or absence of its scrotal attachments.

4. Conditions associated with the cremaster

(a) Retraction of the testis after it has descended to its usual habitat in the scrotum.

(b) Want of action of the internal fibers of the cremaster before the testicle has reached the inguinal canal.

5 Conditions associated with the route along which the testicle has to pass

(a) Ill development of the inguinal canal

(b) Ill development of the superficial abdominal ring

(c) Ill development of half the scrotum.

6 Other conditions such as the wearing of a truss preventing the outward passing of the organ into the scrotum, etc

Eccles goes on to state that the various abnormal positions of the testicle in man may be normal in other animals. Thus the testicle remains in the back of the abdomen near the kidneys in the snake pigeon and frog. In the hedgehog it still lies in the abdomen but close to the inguinal ring while in the hare it lies in the inguinal canal. In apes the processus vaginalis remains open. In the pig the testis normally lies in the peri-

neum. In marsupials the testes occupy a preperineal position. In some animals the position is not permanently scrotal, the organ descending during the mating period and being withdrawn into the abdomen or inguinal canal when the season is over. Eccles states, "It is a fact that the various pathological conditions associated with imperfect descent in the human subject are unknown or almost unknown in those animals in which the testes never transgress the limits of the abdominal wall."

HEREDITY

Heredity seems to play an inconsequential rôle. Here and there are scattered cases giving a history of familial neoplasm or congenital defect, but in general such a history is not found. In one case (Marchand) a brother is said to have died of the same disease.

TRAUMA

I have encountered one case (Pederson (60)) which might be called for want of a better term a traumatic cryptorchid. Fourteen years before coming under observation the left testicle of this patient was driven into the abdominal cavity by a blow from a base ball. Later this testicle became malignant. But trauma does not seem to be a very important factor. Only two cases of congenital cryptorchids give a history of direct trauma. In Johnson's (32) case the tumor and pain were first noted following a blow from a cricket ball. In Martin's (49) case a tumor mass appeared immediately after a blow on the abdomen, this mass not changing in size for two years, and then for a year increasing rapidly. Trauma from the contraction of the abdominal muscles may be a factor in those cases in which the testicle lies at or near the internal ring. It is conceivable and has been suggested that such a testicle may slip temporarily into the canal and suffer compression from muscle contraction. Certainly those testicles situated in the lumbar, iliac or pelvic regions are well protected. Kaepelin (34) believes that the danger of malignant degeneration is less in those testicles situated high in the abdomen. Theoretically this view seems plausible but a study of the collected cases does not substantiate it and the traumatic

view of the etiology of these tumors has but a small foundation.

Many authors, Osborne and Simmons (57) Godard (29) Coley (16) Orth (58) believe or have suggested that the retained testis is more apt to undergo malignant degeneration than the normally situated organ. Cusco and Lucene (17) think that the normally situated organ is more prone to become carcinomatous and the retained testicle sarcomatous. Bland Sutton (8) on the other hand is of the opinion that imperfection of an undescended testicle is the cause, not the result, of its failure to reach its goal in the scrotum. Kaepelin (34) considers the abdominal retained organ relatively immune, arguing that if the malignant cases of abdominal, inguinal and scrotal testicles bore the same ratio to each other as the non-malignant cases, the malignant abdominal testis would be far more common than it is. Statistics already quoted confirm this opinion for we found 1 cryptorchid in 900 men examined, and only 1 malignant cryptorchid in 60,000 men. We must conclude therefore that the abnormally situated testicle is relatively immune to malignant changes.

AGE

Of the 59 cases the age is not stated in 4. The ages varied from 17 to 52 years, the average age of 55 cases being about 34 1/2 years. Forty-two, or a little over 75 per cent, occurred between the ages of 25 and 45 years. These figures correspond remarkably closely to those of Kober (39) who found that 71 per cent of 114 cases of scrotal sarcoma testis occurred between the ages of 30 and 50 and confirms the general opinion that practically all cases occur during the period of greatest sexual activity.

SIDE INVOLVED

Of 56 cases in which the side involved is stated, there were 30 right, 24 left and 2 double. In 1 of the right-sided cases the left testicle was also involved but lay in the scrotum.

SEX

Fifty-five cases were in individuals evidently males. Four cases were in hermaphrodites. Two of these had passed as females and two

as males. Of the females, 1 Marion (47) had been married for 16 years, had no children, and had never menstruated. Vagina was present but laparotomy showed in addition to the tumor complete absence of either uterus or ovaries. The other case, Abel (1) had menstruated for eleven years. Cervix uteri was absent and vagina was small. The diagnosis of congenital vaginal atresia and hematometra was made and a pelvic section done. Patient died a few days later of spreading peritonitis and autopsy showed the mass felt to be a sarcomatous testis. One of the male cases, Primrose (64) showed no other congenital defect of the external genitalia. No history of menstruation. Autopsy showed a well developed uterus and vagina and rudimentary Fallopian tubes. No vasa deferentia or seminal vesicles were found. The right testicle was sarcomatous. The other male case Marchand (46) showed a well formed uterus and carcinoma of one of two abdominal testes.

PATHOLOGY

I have the anatomic material from only the first of my cases. In looking over the cases collected from the literature one is impressed with the variety of pathologic diagnoses given. In some of them, as in my second case the diagnosis has not been confirmed by microscopic section the case clinically and the pathology grossly being both fairly conclusive that the case was one of malignant disease of a retained testis. I have taken the liberty as have previous writers on the subject, of including such cases in the series. The diagnoses given in the 59 cases are as follows:

Sarcoma	20
Round cell sarcoma	
Large cell sarcoma	6
Sphacled cell sarcoma	
Mixed sarcoma	
Myxosarcoma	
Cystic sarcoma	1
Teratoma	
Epithelioma	
Chorio-epithelioma	
Carcinoma	7
Rhabdomyoma	
Cancer	5
	<hr/> 59

GROSS APPEARANCE

The tumors vary in size from a goose egg to masses filling the pelvis or even the entire abdomen. The surface is smooth or grossly nodular covered with peritoneum, glistening and of a white or yellowish white color. Their situation is usually lateral, either occupying the iliac fossa or the pelvis, but they may lie at any point between the internal ring and the lower pole of the kidney. They may be fixed having a sessile base, or mobile, with a long or short pedicle. This pedicle may find its attachment at any point between the lower pole of the kidney and the internal ring. It seems a rule that the higher positions of non-descent are less apt to be associated with pedicle formation than the low positions. The highest pedicle attachment which I have been able to find was at the sacro-iliac joint, while numerous cases are on record where the testicle was found adherent by a pedicle at or near the internal ring.

The point of origin has been determined in but few of them but we can probably accept the statement of Ewing (25) that these tumors have their origin in the rete testis. The main tumor mass has invariably been testicular. The epididymis may or may not be invaded but is usually not involved until a late stage. The majority of tumors have a definite capsule consisting of the stretched tunica vaginalis and because of this capsule peritoneal implantation metastases are not common.

The tumor mass is usually adherent to some of the surrounding structures. Bladder, rectum, pelvic wall, ureters, kidneys, small intestine and its mesentery, anterior abdominal wall, omentum, and great abdominal blood vessels have all been found adherent to it. Pressure may distort or interfere with the function of some of these structures. Thus the rectum may be flattened against the sacrum, the great vessels may be pressed upon and made to deviate from their normal course, or the ureter may suffer pressure causing hydronephrosis.

There is apparently only a slight tendency to generalization through the organs of the body but involvement of the lymphatic nodes occurs fairly early in the disease.

Malignant disease of the testis whether apparently sarcoma, carcinoma, teratoma, etc. spreads by the lymphatic rather than by the blood stream. The exception to this rule is seen in chorio-epithelioma, for in the two cases in the series of this type, Scott and Longcope (70) and Thurmurtl (79) extensive distribution of metastases in the various organs of the body was found and these are the only two cases in the series in which such metastases were found. Their occurrence in Scott and Longcope's case might have been due, however to the fact that the tumor had ruptured into the inferior vena cava.

According to Most (55) the lymphatics from the testis drain first to the lumbar lymph nodes lying at about the level of the lower pole of the kidney. Those from the right testis lie on the vena cava and those from the left testis near the aorta. These nodes freely communicate by anastomosing channels, and they are the only barrier between the testis and the thoracic duct. Most was able to send an injection mass from the testicle to the entrance of the thoracic duct into the subclavian vein. They are not only the first lymph nodes but usually also the first areas in the body to be involved secondarily. Most considers them a very imperfect barrier and judging as shown by Lembs (44) from the great frequency of reports of left subclavicular adenopathy in malignant disease of the scrotal and inguinal testicle, he seems to be correct. On the other hand it is interesting to note that of 59 cases of malignant abdominal testes I find but one case, Piquet (62) in which this adenopathy is mentioned. I am at a loss to explain this discrepancy in progressive metastasis between the malignant testicle situated within the abdomen and elsewhere.

This secondary lumbar involvement produces tumors of various sizes, firm, retro-peritoneal, often larger than the original tumor and frequently displacing if not actually adherent to or obstructing the aorta and vena cava. It is involvement of these nodes which has mainly been responsible for inoperability or recurrence.

All of the cases mentioning metastases of any sort have included also the retroperitoneal lymph nodes, especially those in the

lumbar and pre-aortic region. Next in frequency comes what are apparently transplantation metastases on the peritoneal surface, mainly in the pelvis. Some of these extend high in the upper abdomen one case showing metastases on the peritoneum covering the diaphragmatic surface of the liver and spleen and involving the capsules of these organs. Excluding the two cases of chorio-epithelioma, metastases have been noted in the following structures: psoas muscle; ureter; prostate; periosteum of vertebral column; spinal cord; urethra; kidney; bladder; liver; The two cases of chorio-epithelioma metastasized extensively. The structures involved were as follows: retroperitoneal lymph nodes, inferior vena cava, lungs, liver, myocardium, spleen, kidneys, stomach, intestines, pancreas and brain.

MICROSCOPIC FINDINGS

All of these cases at autopsy or operation were well advanced and the point of origin has been determined in none of them. All have apparently been primary in the testicle with the exception of the cases of Silberberg (73) and Mathieu (50) in which the testicular growth may have been secondary to that of the kidney. Two thirds of them have been described as sarcomata of one form or another. The majority have been reported from a clinical rather than a pathological viewpoint, and if extensive search for remnants of other embryonal structures has been made, it has not been so mentioned.

As no sections of my second case were taken I can make no pathological report upon it.

The findings in my first case were as follows. The specimen is a spherical mass measuring 8 by 7.5 cm. weighing 210 grams. At the upper pole is attached a loop of excised small intestine 6 cm. in length. (Figs. 1 and 2.) Adherent to its lower and inner surface are fibers of muscular coat of bladder. Running along the lower and outer aspect and closely adherent to the surface of the mass is the vas deferens. On dissection the convoluted portions of the vas are seen to be continuous with the globus minor of the epididymis. Epididymis lies flattened over the surface of the mass a distance of 5 cm. Outer surface of actual tumor mass is free, smooth, and con-

tinuous with the peritoneal coat of the excised portion of small intestine. In this free surface are many much-dilated blood vessels.

The consistency of the tumor mass throughout is uniform. There are no areas suggesting in the gross either bone cartilage or structures of ectodermal origin such as hair or teeth.

Cut section through the center of the tumor mass presents homogeneous areas defined by exceedingly delicate striations continuous with one another and with the capsule, suggesting fibrous trabeculae branching from a definite and well formed capsule enclosing the entire tumor. The thickness of the capsule varies from a few mm. to 1 cm.

MICROSCOPIC SECTION

The outer layer of the capsule consists of fibrous connective tissue which in points is edematous and shows numerous cross sections of flattened and atrophic testicular tubules in which no spermatozoa are found (Fig 6). The tumor proper is composed of cells which are large, polygonal or round and contain large, deeply staining nuclei. Numerous mitotic figures are seen. Connective tissue trabeculae support a delicate reticular stroma. These trabeculae divide the tumor into alveoli. Areas are found where a few cells are seen not separated by stroma, definitely suggesting epithelium. Here and there are areas in which these cells are separated by masses of mononuclear leucocytes. There are also seen areas in the tumor where the cells of all types are undergoing degeneration. In certain parts of the tumor are peculiar aggregations of cells which are narrow as if compressed (Fig 5). These cells are elongated, darkly staining and are arranged irregularly in whorls, as if filling in spaces between the alveoli. These cells with Mallory stain appear a faint blue, and suggest fibroblasts rather than any other type of cell. They are not of frequent occurrence being found in only two or three of more than a dozen blocks of tissue taken from various parts of the tumor.

It is thus rather difficult to place this tumor under any classification other than that of a mixed tumor for in addition to the difficulty

of classifying these cells last mentioned we have regions in the tumor in which the small round cells are so closely packed as to suggest a small, round-celled sarcoma, and other regions highly characteristic of an alveolar carcinoma. For these reasons we feel that the case should be classified as a mixed tumor or teratoma of the abdominal testis.

It is not the purpose of this paper to enter into a detailed discussion of the exact pathology of the cases which it collects. Indeed it is impossible to do so for the majority of cases have been reported from a clinical, rather than a pathological viewpoint, and accurate observations are lacking. Detailed studies have been made in only a few of them so that it is not possible to state in how many of them there is absolute proof that the tumors have not shown more than one type of cell growth in other words that they are not tridermal.

Despite the various microscopic findings in the different cases there is a remarkable similarity in the clinical behavior and gross appearance of these neoplasms. From a study of these cases and the literature of testicular tumors, it becomes to the writer more and more evident that the conclusions reached by Ewing (25) that the majority of them are teratomata is correct. His monograph on the subject is so recent and comprehensive that the writer hesitates to again cover the ground, other than to quote his conclusions. With these we agree entirely and quote them as applicable to this series of cases. Among other conclusions reached by Ewing (25) are the following: Chondroma, myxoma, lipoma, rhabdomyoma, and carcinoma have not been shown to exist apart from a teratomatous origin. Primary lymphosarcoma arises in the testicle but its exact cells of origin are as yet undetermined. It may first appear in the rete testis as do teratomata. Pure spindle-cell sarcoma probably arises in the testicle but is rare and its exact origin is uncertain.

"Alveolar large round-cell perivascular and other forms of so-called sarcoma testis are of epithelial and teratomatous origin. Adenoma arising from the spermatic tubule cells is a rare tumor occurring in atrophic undescended testes.

The commonest tumor of the testis is an embryonal carcinoma alveolar or diffuse with polyhedral or rounded cell and often with lymphoid stroma. These tumors are probably one sided development of teratomata.

SYMPTOMATOLOGY

The sudden onset of symptoms is exceptional but acute abdominal pain coming spontaneously or following a blow or sudden exertion may be the first symptom noted. It is probable in these cases that there has been a latent phase during which the tumor has been developing and that some exertion or sudden change caused it to first make itself known. During this period the patient may experience vague and indefinite abdominal pain dull intermittent and not associated with the taking of food with defecation, or with urination. It is usually not the weakening pain of testicular pressure. It may be increased by or occur only during coitus. The pain is frequently lumbar rather than abdominal. In the course of a day to a few months the patient notices an abdominal mass. All of the cases explain sooner or later of one or the other of these symptoms. Pain comes first and mass second in the list of symptoms first noted. The mass is usually lateral lying in the iliac fossa never median. It is usually not tender but as it slowly increases in size various functional disturbances appear and the general health declines. Abdominal tenderness was the first symptom noted in one case. Other symptoms first noted were constipation four times, edema of leg three times, hematuria once, pain in back once, weakness twice, nausea once, painful defecation twice. Of the secondary symptoms noted in addition to abdominal pain and mass may be mentioned the following: Symptoms referable to bladder pressure 6, constipation 4, loss of weight 5, anorexia 2, fever 1, neck tumor 1, edema of leg 3, abdominal tenderness 2, sciatica 1, diarrhea 2. Four of the cases were strangulated with twisted pedicles. These cases all had an acute onset with abdominal pain, fever, mass, nausea, vomiting and objective signs of an acute abdominal lesion.

The majority of cases occur in individuals

otherwise in good health. Cachexia occurs only during the later stages after involvement of other structures and interference with function. On examination one or both testes are found to be absent from the scrotum perineum or inguinal canal. Occasionally the abdominal mass can be felt only by rectum, but abdominal palpation usually reveals it. It is hard lateral in position beneath the parietes usually but very slightly mobile, not tender and dull to percussion. Percussion is usually tympanitic in the flanks, but rarely there may be some areas and dullness obtained. Other secondary masses may be felt or the entire abdomen may be completely filled with tumor mass. The inguinal glands are not enlarged. Enlarged glands at the root of the left side of the neck may be found. There is no rigidity without strangulation.

Various pressure symptoms occur. From ureter pressure a mass may be found in the flank due to hydronephrosis. Edema of the leg from venous or lymphatic pressure is fairly common. In one case a varicocele was found in the anal in the same side as the tumor. The feces may be due to rectal pressure be passed in small evacuated masses. The veins on the abdominal wall may be enlarged and their current reversed.

In nine cases the presence or absence of offspring is definitely noted. Five of these were father of children but all five were single cryptorchid. Four cases had no children. Three of these were single cryptorchid the fourth a double cryptorchid. There is thus not a single case of double cryptorchid with malignant testicle reported. A having of spring. One case noted a having erection only at long intervals and entirely lacking in sexual desire. One case complained of abnormal testicular pain during coitus.

DIAGNOSIS

The first element in the diagnosis is the establishment of the fact that one or both of the testes are not in the scrotum, perineum or inguinal canal. It is well nigh incomprehensible that in a number of the reported cases the absence of the testicle from its normal position was not noted until after death, but such is the fact.

In the early stages of the disease no abdominal mass may be palpable and the pain must be differentiated from that due to floating kidney renal colic appendicitis, pathologic lesions of the intestinal tract as tumors, ulcers, tuberculosis, etc., functional disease, parietal neuralgia, early Gott's disease, bladder pain, pretauric pains, etc.

When a tumor mass is appreciable the diagnosis can readily be made provided the non-descent of the testis is noted. It is unnecessary to enumerate the possible abdominal masses and their differential diagnoses, but again I wish to emphasize the necessity of routine examination of the external genitals in all cases of abdominal tumor especially those in the lower abdomen.

While it is safe to say that the large majority of palpable and painful abdominal testes are malignant the statement cannot be made without reservation. The mass felt may be testicular but not necessarily a malignant tumor of the testis.

Tuberculosis of the abdominal testis is exceedingly rare. Murphy states that no authentic case is on record. The only case I have been able to find is one reported by Roberts in 1878 and quoted by Godard (29). In this case there were found at autopsy a kidney, psoas muscle, and undescended testis "fused into a tuberculous mass." Among large collections of cases of tuberculous testis reported Keyes (38), Barney (3) et al. no cases of the disease in the abdominal testis are noted. No satisfactory explanation of the apparent immunity possessed by these misplaced organs has been offered.

Intra-abdominal orchitis is also exceedingly rare. Cantwell (12) records one secondary to appendicitis, while Descarpentiers (21) records a case following catheterization. Godard (29), Barnett (4) and Le Dentu (43) each report one case of abdominal orchitis probably gonorrheal. These five are the only cases I have been able to find. No cases of syphilitic orchitis abdominalis have been reported. I have found no cases of abdominal orchitis following mumps.

Non-malignant tumors of the abdominal testis are practically unknown. Rothmann

(67) in 1901 collected ten cases of hydrocele abdominalis with preformed sacs. I have been unable to find other reports either of the various cystic or solid non-malignant tumors commonly found in the scrotal testicle and epididymis.

Various associated congenital deformities may be found and so assist in the diagnosis. Of the 59 cases 31 were single cryptorchids, 19 were double cryptorchids, 4 were hermaphrodites and in 5 the exact condition is not stated. For the sake of brevity I have tabulated the abnormalities in these cases. They are in addition to retention of the opposite testis just mentioned as follows:

- In 7 cases inguinal hernia
- In 5 cases, hypospadias
- In 1 case unusually small penis.
- In 1 case absence of erectile body of penis
- In 1 case total absence of penis.
- In 1 case opposite testicle in inguinal canal.
- In 1 case cleft palate
- In 1 case club foot.
- In 1 case horseshoe kidney with double ureter
- In 1 case double kidney with double ureter
- In 1 case angioma of liver
- In 1 case clawlike deformity of hands and feet and absence of some of phalanges.

Associated deformities are thus seen to be fairly common. In addition to those which I have given Eccles (23) mentions the following: Spina bifida, ectopia vesicæ, non-descent of the cæcum, double penis and mammary hypertrophy.

The diagnosis before operation or autopsy of malignant abdominal testis in the female hermaphrodite has not as yet been made. The possibility of the condition should however be kept in mind, particularly in dealing with women who are sterile and show other evident congenital abnormality.

PROGNOSIS

In considering the prognosis it must be born in mind that the majority of patients do not present themselves for treatment until the disease has progressed to a fairly late stage, for until complications from pressure etc. arise the patient is apt to be without symptoms. Statistics from this series of cases show a very poor prognosis. Five were discovered at autopsy. Ten cases when first seen were considered inoperable and accordingly no

intervention was made. Four of these cases were lost sight of. The remaining six all died in less than one year. In seven cases exploratory laparotomy only was done, the tumor mass at time of operation being either so large or so adherent that excision was thought inadvisable.

In 37 cases excision was done. Four of these died shortly after operation from causes directly traceable to operative interference, an operative mortality of 10 per cent. Of the remaining 33 cases the ultimate result is not known in 18. Of the 15 cases in which the result is known, 8 were reported dead within one year. Of these 8, 3 died during the first three months after operation, three during the second three months, and the other two within the year. All these eight cases died from recurrence. Of the seven cases reported well, 2 are known to be well 3 months after operation, 1 for four months, 1 for six months, 1 for two years and three months, 1 for two years and ten months, and 1 for three years. Beyond these periods of time none of the cases were traced.

The results of operation after the onset of symptoms are therefore very poor. Of 47 cases operated upon, only 3 are known to be alive and well after two years.

TREATMENT

The proper treatment directed towards the permanent cure of these cases therefore hinges on one of two possibilities, either the removal of the testis before malignant growth starts, or removal after such growth starts but before the onset of symptoms.

Volumes have been written on the treatment of the undescended testis and it is not the purpose of the writer to further discuss this question, except as it may directly bear on our subject. In the treatment of each case of abdominal undescended testis the question resolves itself into whether an attempt shall be made to replace the organ in the scrotum, whether it shall be left in the abdominal cavity and only the oft associated hernia repaired, or whether the organ shall be removed. The value of transplantation to the scrotum other than for cosmetic purposes is decidedly questionable, for the abdominal

testis usually lacks the power of spermatogenesis and it is pretty generally agreed that the mechanical act of transplantation does not create this power in the organ. A priori, there is no reason to see why it should do so. Cases of spermatogenesis and fertility have been recorded following transplantation but, as Eccles (23) points out, there is abundant proof that the arrested testis is capable of producing well formed and active spermatozoa. This fact has been indubitably proved by the microscopical examination of the semen which has been ejaculated and of the lining epithelium of the tubules themselves, in addition to the evidence of the procreation of children. It is possible if not probable that the cases of transplanted testes which have become fertile would have functionated within the abdomen. Orchiectomy is not justifiable before the age of puberty as many testes do not completely migrate to their normal position until that time. It seems to the writer that instead, as is so often done, of operating on these cases of abdominal testes before the age of puberty it would be better and more conservative surgery to advise the patient against operation, excepting always those cases having associated hernia demanding immediate relief. The patient should invariably be told of the possibility of malignant degeneration and impressed with the necessity for reporting at a later date for observation. At this later date many of the testes will be found to have migrated into the scrotum.

Cases presenting themselves after the age of puberty present a different problem. The patient has then passed the age of probable late descent and is entering upon the period of sexual activity, the period in which the large majority of malignant testicular degenerations take place. The question now arises as to the possibility of degeneration. This is relatively small for taking together the figures of Marshall (48) and Monod and Tertilt (54) we found 1 cryptorchid in 800 men examined while we found 1 malignant cryptorchid in 60,000 men. Thus we can state roughly that about 1 in every 75 abdominal testes will become malignant. This estimate is, however, probably too high. It is the opinion of

the writer that if the individual has one testicle in the scrotum, the abdominal testis should after puberty be removed. The question arises as to what part in the general body growth the undescended testis plays. In man there is only rarely a compensatory hypertrophy while in the stallion there is such an hypertrophy. The removal of one testicle is probably harmless.

Thirty-one of our cases were single cryptorchids developing malignancy in the abdominal testicle. All would have been saved had an abdominal orchidectomy been done before the onset of malignancy that is, shortly after puberty.

It is less easy to render judgment on the double cryptorchids. These cases should also be warned of the possibility of malignant degeneration and examined at frequent intervals. It can be only by repeated examination of these patients that early objective symptoms followed by operation and good results will be obtained. It hardly seems justifiable in the absence of subjective or objective signs to advise double orchidectomy.

After the onset of symptoms of malignancy or as soon as a diagnosis of tumor is made, immediate abdominal orchidectomy should be done. Whether the operation consists of simple orchidectomy or more involved procedures, such as the removal of glands or resection of structures to which the mass is adherent, must be decided for each individual case at the time of operation. It must be borne in mind that extension takes place by the lymphatics. Chevrassu (13) believes that it always takes place in this manner and that extension by the blood stream can take place only by way of the thoracic duct or by direct involvement of the spermatic or renal vessels or the inferior vena cava. The glands to which particular attention should be paid are those situated around the aorta and vena cava from their bifurcation below to the level of the renal artery above. Excision of these, together with the malignant testicle should in the early cases give but a very low operative mortality and a large percentage of permanent cures.

CONCLUSIONS

1. Malignant disease of the abdominal testis is relatively rare but frequently over

looked. In general hospital male admissions it is seen about once in each 60 000 cases. About one in every four cases of malignant abnormally situated testicle is found within the abdomen. About one malignant abdominal testicle occurs to each fifteen malignant scrotal testicles. About one of each seventy five abnormally retained testes will become malignant.

2. Cases occur mainly during the years of greatest sexual activity, may occur in apparent females and are slightly more frequent on the right than on the left side.

3. The structure of the tumors differs markedly but most of them are probably teratomata. Other associated congenital malformations are fairly frequently found.

4. Symptoms do not occur until the size of the tumor or its metastases cause pressure.

5. The prognosis is bad. Of the 59 reported cases only 3 are known to be alive and well after two years.

6. Treatment should be excision, preferably before the onset of symptoms and after the age of puberty.

In closing I wish to express my indebtedness and thanks to Dr J. A. Blake for permission to publish the two original cases to Dr W. C. Clark for most valuable assistance in pathology and to Dr Boleslaw Lapowski for translations from the Russian.

ABSTRACT OF CASES FROM THE LITERATURE OF MALIGNANT DISEASE OF THE ABDOMINAL TESTICLE (ARRANGED CHRONOLOGICALLY)

CASE 1. 1859. Johnson (33) Male, age 27. Following blow on abdomen from cricket ball patient developed pain in abdomen, bladder symptoms, abdominal mass, and constipation. Right testicle in scrotum. No operation. Died five years after onset of symptoms. Autopsy showed tumor mass containing many cysts. Weight, 14 pounds. Diagnosis, carcinoma.

CASE 2. 86. Martin (49) Male, age 17. Left scrotum empty. Three years previously blow abdomen giving sickening testicular pain. Swelling size of egg appeared and remained stationary for two years. Then sudden pain in mass after exercise with enlargement of tumor. Operation. Mass adherent to bladder. Diagnosis, Fibro cystic encephaloid degeneration. End result not stated.

CASE 3. 83. Bögehold (10) Male age 30. Double abdominal cryptorchid. For six months right testicle enlarged. Now size of fist. Laparot

omy and excision. Operative recovery. End result not given. Diagnosis, sarcoma. First reported operative case.

CASE 4. 1881. Mathieu (50) Male age 40. Autopsy case. Died of apoplexy. Said to have had abdominal tumor for eleven or fifteen years. Autopsy showed double cryptorchid. Sarcoma left testicle and left kidney. Weight of testicle 460 grams.

CASE 5. 1882. Galliard (27) Male age 30. For four years had noted tumor mass in left lower abdomen. Considered inoperable. Died. Autopsy showed a malignant testicular tumor in left iliac fossa near internal ring. Metastases in lumbar lymph nodes psoas muscle left ureter (causing hydronephrosis) and in peritoneum of vertebral column.

CASE 6. 1885. Wells (92) Male middle aged. Father of children. Left testis in scrotum. Right absent. Abdominal tumor for one year. Laparotomy. Mass adherent to surrounding structures. Shelled out of capsule (tunica vaginalis) and removed. Died on third day from peritonitis. Weight of tumor nine pounds. Diagnosis malignant tumor. Testis not forwarded.

CASE 7. 1886. Myrill (5) Male age 40. Double cryptorchid. Atrophic right testicle palpable in right inguinal canal. First degree hypospadias. For two months abdominal pain. For one month abdominal tumor. Laparotomy removal very difficult. Intestinal resection necessary. Died one month later from recurrence. Diagnosis round-celled sarcoma.

CASE 8. 1887. Von Kahlen (8) Male age 44. For one year dragging pain in abdomen. Double cryptorchid. Laparotomy and right castration. Operative recovery. End result not given. Diagnosis myxosarcoma.

CASE 9. 1890. Abel (1) Female age 1. Hermaphrodite. Menstruation regular since age of 20. For some months abdominal pain independent of menses. Bowels and urination normal. Cystic mass felt in left lower abdomen. Vagina small. Cervix indistinct. Thought to be atresia vagina and hematometra. Posterior colpotomy followed by death from spreading peritonitis. Autopsy showed mass to be sarcoma of retained left testicle. Right testicle in inguinal canal.

CASE 10. 1891. Picquet (81) Male age 44. For eight months pain in lower abdomen. For seven months tumor. Mass felt in left lower abdomen and pelvis. Some constipation and dysuria. Laparotomy. Mass adherent to omentum and small intestine. Attached to internal ring by pedicle. Removed. Operative recovery. End result not given. Diagnosis cancer.

CASE 11. 1893. Farwick (26) Male age 30. Pain in abdomen for one month. Laparotomy and excision. Mass size of adult head. Operative recovery. End result not given. Diagnosis mixed sarcoma.

CASE 12. 1894. Bittjagin () Male age 49. Double cryptorchid. Very small penis. Scrotum

undeveloped. Hematuria for 10 years followed by abdominal tumor. Developed left subclavicular adenopathy. Considered inoperable. Autopsy showed large mass compressing vessels of leg and bladder. Metastases in prostate. Diagnosis, sarcoma.

CASE 13. 1895. Silberberg (71) Male, age 36. For some months pain in abdomen radiating to lower extremities. Sensation of pressure. Difficulty in urination. Left cryptorchid. Laparotomy. Tumor of left testicle adherent to and involving left kidney. Mass removed leaving kidney in place. Operator expecting to remove it by lumbar incision at a later date. Patient developed peritonitis and died. Autopsy disclosed absence of right kidney and double reter from left kidney. Diagnosis, sarcoma.

CASE 14. 1896. Riedel (66) Male age 38. Right cryptorchid. Tumor for right inguinal hernia for 24 years. For four years abdomen increasing in size. For one week dyspnea and edema of feet. Laparotomy. Mass extraperitoneal behind iliac vessels. Removed with difficulty. Well three months after operation. Diagnosis, round-celled sarcoma.

CASE 15. 1896. Eigenbrodt (24) Male, age 30. Left cryptorchid. For 10 weeks pain in abdomen followed by mass. Pale cachectic. Mass filling lower abdomen. Right testicle in scrotum. No children. Slight hypospadias. Laparotomy. Few adhesions. Broad pedicle at internal ring. Excision. Free from recurrence three years later. Diagnosis spindle-cell sarcoma.

CASE 16. 1896. Balloch (3) Male age 20. Left cryptorchid. Abdominal pain and tumor for number of years. Laparotomy. Inoperable mass adherent to bladder rectum and pelvis. Died 10 weeks later. Autopsy diagnosis round-celled sarcoma.

CASE 17. 1897. Pike (63) Male age 70. Double cryptorchid. Complained of edema of right leg. Cleft palate double club feet. Laparotomy. Excision. Operative recovery. Weight of tumor 3 pounds, 6 ounces. Ultimate outcome not known. Diagnosis, round-celled sarcoma involving globus major and minor.

CASE 18. 1897. Kaufmann (36) Male age 36. Right cryptorchid. For five weeks pain in abdomen and legs. Abdominal mass and edema of left leg. Refused operation. Uremia, pneumonia and death. Autopsy showed carcinoma of left testis, also involving epididymis. Adherent to omentum, rectum and left ureter pressure on both ureters causing double hydronephrosis.

CASE 19. 1898. Schmidt (69) Sarcoma of testis lying in upper part of pelvis.

CASE 20. 1898. Gerster (28) Male, age 1. Double cryptorchid. Erectile body of penis. No penis urethra. Third degree hypospadias. One day acute history of abdominal pain, vomiting, fever and mass in right lower abdomen. Laparotomy. Sarcoma testis size of child's head, with

twisted pedicle removed. Post-operative history not given.

CASE 1. 898. Kronpecher (4) Male age 7. Double cryptorchid. Small round-celled sarcoma.

CASE 2. 1808. Meiser (53) Male age 45. Left cryptorchid. Right testicle in inguinal canal. For seven years obstinate constipation. For six weeks abdominal pain, constipation worse, burning urination. No children. Sexual appetite lacking. Laparotomy. Excision of mass. Weight 230 grams. Died in three months from recurrence. Diagnosis, sarcoma.

CASE 3. 1898. Primrose (64) Male, age 32. Double cryptorchid. Abdominal tumor for three months. Laparotomy. Inoperable. Died few hours after operation. Autopsy showed well formed uterus and vagina between bladder and rectum. Also rudimentary Fallopian tubes. No vasa deferentia or seminal vesicles found. Diagnosis, sarcoma.

CASE 4. 1899. Kaeppel (33) Male age 4. Right cryptorchid. One child. Left testicle in scrotum. Pain in abdomen and slowly developing mass. Laparotomy and excision. Pedicle of internal ring. Operative recovery. End result not given. Diagnosis, epithelioma.

CASE 5. 1900. Kayser (37) Male age 29. For five weeks pain at stool. Recently abdominal pain. Laparotomy and excision. Metastases felt in liver at time of operation. Died four months later of metastases. Diagnosis, sarcoma.

CASE 6. 1900. Pederson (60) Male age 7. Stage of 13 baseball drove left testicle into abdomen. Abdominal tumor of gradual growth for fourteen years. Laparotomy. Excision. Operative recovery. Excellent outcome not given but getting worse when last seen. Diagnosis, large round-celled sarcoma.

CASE 7. 1900. Marchand (46) Male age 24. Double cryptorchid. Abdominal tumor for four months. Laparotomy. Inoperable. Brother said to have died of same disease. Death. Autopsy well formed uterus. Mass adherent to mesentery abdominal wall and bladder. Metastases in liver. Diagnosis, carcinoma.

CASE 8. 901. McDonagh (5) Male, age 40. Tumor of right testicle. Mass lying partially in abdomen and partially in inguinal canal. Excision. Weight 235 pounds. Outcome not given. Diagnosis, large round-celled sarcoma.

CASE 9. 901. Soullgroux (74) Male, age 7. Left cryptorchid. For three weeks abdominal pain and vomiting. Some diarrhea. Mass in left inguinal region thought to be testicle but operation found it to be varicocele. Second mass in abdomen. Inguinal mass first cut down upon, mistake discovered, and abdominal mass removed. Operative recovery. Ultimate outcome unknown. Diagnosis, epithelioma apparently of Wolffian origin.

CASE 10. 900. Scudder (7) Male age 8. Double inguinal hernia. Left cryptorchid. Abdominal mass for three months. Laparotomy. Excision. Blood peritoneal fluid. Operative e-

covery. Died seven months later from recurrence. Autopsy showed round-celled sarcoma with metastases into spinal cord from eleventh dorsal to first lumbar vertebrae.

CASE 31. 190. Derlin (20) Male, age 37. For one and one half years abdominal pain. For four weeks swelling of right leg. Laparotomy. Mass size of goose egg excised from near right sacro-iliac joint. Short mesorchid. Operative recovery. Ultimate outcome not given. Diagnosis, round-celled sarcoma.

CASE 3. 903. Shevandi (72) Male, age 33. Right cryptorchid. Pain in back and lower abdomen where a mass is felt. Laparotomy. Inoperable. Edema of lungs death. Autopsy showed mass filling abdomen from diaphragm to second lumbar vertebra. Pelvis filled with tumor nodules. Nodules in mesosigmoid on peritoneum covering liver and spleen, in membranous urethra, and in lungs. Diagnosis, sarcoma.

CASE 33. 903. Benenati (6) Male age 49. Left cryptorchid with left inguinal hernia. Father of children. For three years obstinate constipation and slow development of abdominal mass and pain. Autopsy showed rhabdomyoma.

CASE 34. 904. D'Ruby (9) Male age 24. Congenital left inguinal hernia and left cryptorchid. Hypospadias. Weakness pain in back and edema of right leg. Inoperable abdominal mass. Autopsy showed mass occupying major portion of abdomen with broad base adherent to lumbar spine. Liver free. Diagnosis, carcinoma.

CASE 35. 904. Rademacher (63) Male age 33. For three months abdominal tumor. Laparotomy. Enormous retroperitoneal mass extensively adherent. Attempt at removal. Death eight hours after operation. Diagnosis, round-celled sarcoma.

CASE 36. 904. Osborne and Simmons (57) Male age 8. Laparotomy. Excision. Death in one year from recurrence. Diagnosis, large round-celled sarcoma.

CASE 37. 1904. Osborne and Simmons (57) Male, age 46. Laparotomy. Excision. Died two months later from recurrence. Diagnosis, round-celled sarcoma.

CASE 38. 1904. Osborne and Simmons (57) Male age 46. No operation. Death one year later coming under observation. Diagnosis, sarcoma.

CASE 39. 904. Toussy (80) Male age 33. Double cryptorchid. Right inguinal hernia. Absence of penis. Hypospadias. Claw-like deformities of hands and feet some phalanges being absent. Emaciation and abdominal pain for two years. Laparotomy. Excision. Recurrence in two months. Died 5 months after operation. Diagnosis, carcinoma.

CASE 4. 1905. Mario (47) Female age 36. Married for six years. Never menstruated. Complained of abdominal tumor. Feminine frame. Breasts and external genitals normal. No hair on face or cervix. Laparotomy with diagnosis of terine fibroid and imperforate cervix. Mass ad-

herent by pedicle to innominate line. No uterus or ovaries. Mass excised. Diagnosis, alveolar sarcoma of right testis. No spermatozoa found.

CASE 41. 1905. Scott and Longcope (70) Male, age 45. Cryptorchidism not noted during life. Complained of cough, dyspnea, and general weakness of some months' duration. Blood-stained sputum. For three months severe right sciatica. Some loss of weight. Autopsy showed double cryptorchid. Diagnosis, chorio-epithelioma of right testis with metastases: retroperitoneal lymph nodes, rupture into inferior vena cava, secondary growths in lungs, liver, myocardium, spleen, kidneys, stomach, intestine.

CASE 42. 1905. Mantovani (43) Male, age 5. Right cryptorchid. Father of six children. For seven months pressure in abdomen, anorexia, loss of weight. For one month abdominal mass. Laparotomy. Excision. Operative recovery. End result not given. Diagnosis, cancer.

CASE 43. 1905. Wyeth (81) Male, age 30. Left cryptorchid. Right testicle in inguinal canal. Right inguinal hernia. N children. Lost 15 pounds in weight. Laparotomy. Double castration. Well four months after operation. Diagnosis, sarcoma of both testis.

CASE 44. 905. Stiles (77) Male, age 30. Right cryptorchid. For seven months attacks of abdominal pain of short duration with frequency of urination. Laparotomy disclosed strangulated sarcomatous right testicle. Excision. Operative recovery. Well three months later.

CASE 45. 906. Black (7) Male, age 37. Right cryptorchid. For one month abdominal pain, poor appetite, and constipation. Laparotomy. Excision. Free from recurrence two years and ten months after operation. Diagnosis, carcinoma.

CASE 46. 1906. Cocoma (4) Male, age 34. Double cryptorchid. For five years abdominal tumor. Laparotomy. Excision. Operative recovery. End result not given. Diagnosis, sarcoma.

CASE 47. 906. Cocoma (4) Male, age 37. For eighteen months mass size of hen's egg in right lower abdomen. Excision. Operative recovery. End result not given. Diagnosis, sarcoma.

CASE 48. 1907. Le Conte and Crispin (42) Male, age 8. Double cryptorchid. Acute history of abdominal pain, fever and vomiting. Examination showed generalized abdominal tenderness and tumor mass in right lower abdomen. Laparotomy for appendix abscess with spreading peritonitis. Instead strangulated large round-celled sarcoma with pedicle attached about two inches above internal ring found. Excised. Weight 470 grams. Operative recovery. End result not given.

CASE 49. 1907. Steinoff (76) Male, age 32. Double cryptorchid. Recurrent attacks of abdominal pain, tenderness, nausea, and diarrhea. Laparotomy. Inoperable retroperitoneal mass with many smaller tumors. Death six days later. Autopsy. Teratoma with metastases only on aorta of intestine and mesentery.

CASE 50. 907. Boese (9) Male, age 38. Father of six children. For seven months pain in abdomen, and mass. Laparotomy. Excision. Weight of mass 10 grams. Pedicle attached to retroperitoneal tissue in left iliac fossa and had half a twist in it. Operative recovery. End result unknown. Diagnosis, strangulated sarcoma testis.

CASE 51. 1907. Oeler (59) Male, age 39. Double cryptorchid. Double inguinal hernia. Effeminate. For eight weeks abdominal mass, loss of flesh and strength. Considerable scrotal. Laparotomy. Inoperable. Died one month later.

CASE 52. 1907. Oeler (59) Male, age 46. Left cryptorchid, and left inguinal hernia. Pain in the abdomen for three weeks. Increasing constipation. Diagnosis, sarcoma.

CASE 53. 1907. Oeler (59) Male, age 45. Right cryptorchid. Pain in abdomen for three months. Laparotomy. Inoperable. Death nine months after onset of symptoms. Diagnosis, sarcoma.

CASE 54. 909. Kaltenbach (35) Male, age 39. Double cryptorchid. For three weeks weakness of left leg. For eight days swelling of leg. Laparotomy showed inoperable mass. Died two days later. Autopsy showed sarcoma of left testicle with metastases into retroperitoneal and preaortic lymph nodes, and around rectum and sigmoid. Atrophied right testis. Double right kidney and double right ureter left hydronephrosis and angiosarcoma of liver.

CASE 55. 910. Pfaff (6) Male, age 38. Familial history of cancer. Left cryptorchid and inguinal hernia. For three months point of soreness in lower abdomen. Pain during coitus. Laparotomy. Mass with pedicle attached to internal ring excised. Reported five months later as dying from recurrence. Diagnosis, large round-celled sarcoma.

CASE 56. 910. Sabela (68) Male, age 35. Right cryptorchid. Three months previously left sarcomatous scrotal testicle removed. Had noted for years a mass in right lower abdomen, recently enlarging. Laparotomy. Excision. End result not given. Diagnosis, sarcoma.

CASE 57. 910. Trumurti (79) Male, age 35. Right cryptorchid. For two months pain in abdomen and thorax. Autopsy showed mass adherent to ileum, sigmoid, rectum, and bladder. Metastases in lung, liver, kidney, pancreas and brain. Cryptorchidism not noted until autopsy. Diagnosis, chorio-epithelioma.

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tion to determine the cause of such symptoms as she may have. I believe however that it is not best nor wise to leave to the general practitioner the teaching of their women patients. Furthermore and I believe that this is an important one. I know of no better way to impress upon the general practitioner his personal responsibility for the proper handling of the cases that come under his care than the knowledge that the laity has been told by competent authorities, certain definite things as regards cancer and that the laity will know if he makes any mistake in an individual case. If a general practitioner knows that any mistake he makes in regard to cancer will be known to the community, he will be more careful that such a mistake does not occur and that the doubtful case is in the hands of some one who knows how to give her the benefit of the most modern method of diagnosis. If we could teach women that any lump in the breast may be a cancer and that the only way to be absolutely sure whether it is or not, is to remove it and have it examined microscopically, few general practitioners would have the courage to make a positive diagnosis that any lump in the breast is a benign condition and does not need removal. This fact is well illustrated by the attitude of the laity in regard to appendicitis at the present time. It is no longer necessary to urge an operation for appendicitis as soon as the diagnosis of acute appendicitis is made the family wants to know how soon it can be done and to what hospital the patient should be sent. The physician who makes a mistake in the diagnosis of appendicitis or neglect an early operation risks his reputation in the community in which he lives.

This is as it should be and as it should be relative to carcinoma of the uterus, and as it will be when the laity has the same knowledge of carcinoma of the uterus that it now has of appendicitis. The mere fact that the physician knows that his patient has been, or may have been taught this simple, clean-cut fact will make him more alert as to the condition himself.

In regard to the way that such a campaign should be carried on it should I think be

conducted on the same plan that any publicity campaign is conducted. There is beyond question a perfectly legitimate use even for a medical man of the publicity man and press agent. He is constantly used in the political world and the business world and there is no reason why we should not also use him to accomplish medical ends. There is at present a very definite public health movement going on throughout the country. Newspapers and periodicals of the highest type will now accept and publish articles that they would not dream of doing five years ago. Journals now are willing to accept articles on eugenics and on venereal diseases and they would certainly not make any objection to articles on such subjects as carcinoma of the uterus and carcinoma of the breast. A number of very prominent monthly and weekly papers have signified their willingness to publish such articles for us.

In considering any definite plan to undertake a campaign of education on the subject of carcinoma of the uterus it must be understood that it will involve a great deal of labor over a considerable period of time, running probably into years and that the direct result may be difficult to see. It should be undertaken only with the conviction that it is the right thing to do and with a willingness to continue it because of that belief even if the results are not directly apparent. The labor involved is such that there is probably no man or group of men engaged in clinical practice of medicine who will have the time to devote to carrying it out. Therefore it must be done largely by laymen. It would however be necessary that the work should be carried on under definite medical supervision.

A campaign of education on the subject of cancer is not unlike the campaign of education that has been carried on during the past few years on the subject of tuberculosis and we are fortunate in being able to profit by the experience gained in that work.

In the educational work on tuberculosis there has been located in New York a controlling force which has had the general direction of the work, with a large number of sub-committees throughout the country. Free use has been made of the newspapers and

magazines in the publication of articles and press bulletins. These articles and press bulletins are written largely from choice by laymen. These press bulletins are short articles of one hundred to five hundred words on the relationship of tuberculosis to some popular subject, as a news item and mailed to about eight thousand newspapers about every two weeks. There is in this a large amount of publicity at a comparatively small expense. Frequent use is also made of exhibits, lectures, circulars, etc. The subcommittees or local societies throughout the country assist in local lectures and papers, distribution of literature, etc., under the direction of the central body.

If this work is undertaken there should be a central committee composed of rather a large number of men who would have a general direction of the work, and general supervision of all literature. It would be necessary for this committee to employ on a fair salary some laymen to take over the detail work of the movement, including writing of any articles to appear in the magazines and also such press bulletins as may be sent out to the newspapers throughout the country.

One of the first essentials in the early recognition of carcinoma of the uterus is the routine microscopic examination of tissue removed from every suspicious case. This microscopic examination of all tissue removed in any case should be within the reach of every woman and should be free to every woman who cannot easily afford to pay for it. The Board of Health in New York and other cities has for years made without charge the bacteriological examinations necessary to positively diagnose or exclude diphtheria. It has furnished the necessary sterile tubes, established receiving stations, and made the collections in order to get all the doubtful cases by making it easy to both physician and patient. To accomplish this same end there should be an arrangement made for the free examination of all suspected tissue. The nature of this arrangement would vary in different places. In a city like New York it should be possible to have this done in the Board of Health laboratories and I think it would not be difficult to make such an arrangement. Under some

circumstances, this work might be undertaken in the laboratory of a medical school or hospital. From small places the tissue, properly preserved, could be mailed to a larger center. Detailed instruction for removing tissue, preserving and mailing it to the proper place should be in the hands of every physician. In short, the microscopic examination of all doubtful tissue is a legitimate public expense and it is my belief that it is our place to show the public the importance and necessity of these examinations and that the expense will be met.

There are in this country no reliable statistics on carcinoma of the uterus. This was well illustrated by the papers read before this society last year. A few men have a small list of cases, but we have no correct estimate of the number of cases in the country, the percentage of operability nor cures. We have in fact very little that we can state to the public that is based on accurate statistics, and can only make the abstract statement — based on experience and opinion, but not on accurate statistics — that if the case is seen early we can effect a cure in many cases. The securing of accurate statistical information on cancer of the uterus in the United States should be an important function of this general committee and to accomplish this the free examination of tissue should depend on the willingness of the physician to keep the committee (possibly through the laboratory making the examination) informed as to the course and outcome of the case.

In this way accurate statistics based on reliable examinations would be obtained. One of the duties of this central committee which is of the greatest importance is the formation of subcommittees or societies to carry on the work in different places. Educational work is always largely local. Men in one state cannot educate women in a distant state as it must be done locally. The formation of these subcommittees or societies should be done with great care because unless the right men are placed in charge nothing will be done. These committees should be made up so far as possible of members of the American Gynecological Society but in such states or parts of the country where we have no men

bers the committee should be made up of medical men who are not members of this society but who are interested in the work. Use should also be made of any society or organization that is interested in the work and willing to take a part in it. The general committee, made up of men more particularly interested in the subject and possibly more directly interested in the success of the movement, would act as an advisory committee to these subcommittees in a general way suggesting what is wise to do in different communities.

As an outline of what these local committees might do I would suggest the following things.

It might be that each county society in the state hold at least one meeting a year on the subject of cancer laying particular stress on the importance of early symptoms and the early operation.

It could see that the local medical journals carry in repeated editions, as one of the New York medical journals offered to do for me a short article giving the early symptoms of carcinoma of the uterus in order to impress them more forcibly on the minds of medical men. The notices sent out by these medical societies might include short notices of the early symptoms of carcinoma of the uterus.

The notices of the Medical Society of the County of New York for some years past, have contained a small card relative to the milk commission. It would seem to me that possibly they would be willing now to drop the notices of the milk commission for a time and enclose instead or possibly along with it, a card containing the early symptoms of carcinoma of the uterus. Not that the medical men do not know these but in order to

impress more definitely on their minds the necessity of paying attention to these symptoms. So much for the further education of the medical men in a given community.

So far as the education of the people themselves is concerned nothing would be more important than more careful education of all trained nurses. Every class graduating from a training school should have one or more lectures on the symptoms and the importance of the recognition of these symptoms in carcinoma of the uterus. Because no class learns the symptoms from patients earlier than the nurses. If nurses knew the importance of irregular bleeding we would get some cases earlier. In other countries the education of midwives on the subject of carcinoma of the uterus has brought very favorable results. While the results in this country are not so striking certainly in our large cities such as New York where the midwives deliver a very definite percentage of women and their influence among a certain class in the community is very definite, there is no question that much could be accomplished by more careful education of midwives as to symptoms of carcinoma of the uterus.

The local committees should be prepared to deliver lectures on the subject of carcinoma of the uterus and its early symptoms and the importance of early operation, before any body of women who express the desire for such information. It might include women's clubs, school teachers, mothers clubs and so on. In general the subcommittees should be ready to co-operate with the main central committee and carry out, in its own community work done in other places by similar committees.

LESIONS OF THE HYPOPHYSIS FROM THE VIEWPOINT OF THE SURGEON

By CHARLES H. FRAZIER, M. D. PHILADELPHIA

DURING the past six years or more the hypophysis has been the object of study from many points of view. Elaborate contributions have been made to the physiology, the pathology and the treatment of pituitary disturbances but despite the number of experiments, despite the number of autopsies and of operations there remain many problems in the pituitary question still unsolved.

Many of these, if not most of them are of more than academic interest, and vitally concern the surgeon in his efforts to deal intelligently with the manifold expressions of hypophyseal disorder. Not the least of these is the question as to whether one or all of the component parts of the hypophysis are essential to life. It is not necessary to refer in detail to the investigations of Horsley, Biedl, Friedmann and Maas, Lomonaco, Fichera, Gemelli, Gaglio, Allen and Sweet, on the one hand or of Marinco, Vasale and Sacchi, Gatta, Caselli, Pirone, Pavesio, Garnier, Thon, Livon, Harbout, and Cushing on the other. Suffice it to say that they are absolutely contradictory in their results. From the standpoint of accuracy in observation and delicacy and refinement in technique, nothing is left to be desired in the research of Sweet and Allen who assert unequivocally that the removal of the entire hypophysis is not incompatible with the metabolic processes essential for the maintenance of life. Irrespective of the methods of exposure the surgeon is confronted at once with the problem as to how much tissue may be removed at any given operation. Could anything be more unsatisfactory for the surgeon after exposure of a lesion than to be uncertain as to how best to deal with it? I have gone over in great detail the descriptions of many operations by many operators, and have been impressed with the extraordinary lack of detail as to the methods in which the tumor was dealt with. This commentary is not advanced as a reflection

on the technique of any individual or individuals, but cited merely to call attention to a very serious obstacle that confronts the surgeon. The following, for example are quotations from the descriptions of operations taken at random: "large fragments of friable growth scooped out," "large pulsating mass bulged through opening and partially removed," "removed intrasellar part of tumor," "removed large part of tumor."

Time will not permit of any discussion of the respective functions of the component parts of the pituitary body. This, however is not germane to the subject. But we must revise our conceptions sooner or later with reference to the symptom-complex of pituitary disease. Were it possible, it would be most desirable to be able by a careful analysis of the symptoms to know in advance of the operation something of the character of the lesion, i. e. whether a struma, hyperplasia or tumor. As a matter of fact, this is altogether out of the question. There is the widest variation in the expressions of the disease wholly irrespective of the pathological process. There has been an attempt to distinguish between the so-called hyperpituitary and the hypopituitary group of cases, and yet there are many instances in which combined in the same case there is the expression of both the acromegalic type of Marie and the dystrophic type of Frohlich, and yet again there are others where there is no evidence whatsoever of any disturbance of the metabolic processes, as in two cases upon which I recently operated where the only symptoms were due to pressure on the optic chiasm and to intracranial tension. One of these patients had been under observation many months, and yet the true nature of the lesion was not recognized until an X-ray revealed the structural alterations in the sella turcica (Fig.). In one of the cases reported by von Eiselsberg¹ both acromegaly and dystrophy phenomena were

¹Arch. f. klin. Chir. 1909.

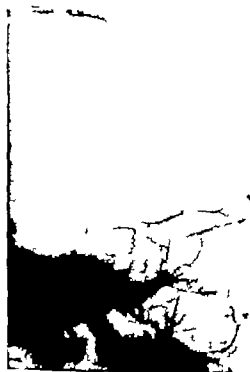


Fig. 1. Skilograph of patient without symptoms peculiar to pituitary disease other than the headache and optic atrophy showing the characteristic enlargement of the sella turcica.

conspicuous at the operation an adenoma was found and in part removed.

The impression has become prevalent that acromegaly is the result of a hypersecretion such as might accompany simple hyperplasia or perhaps an adenoma and yet there are instances, as in the case reported by Kocher where the histological examination of the tumor revealed a round-celled sarcoma.

To illustrate further the absolute lack of conformity I might cite one of my own cases as an example (and many others are to be found) in which the specimen which I removed at operation proved to be an adenoma and yet there were absolutely no evidences of acromegaly or of any other tissue change though the tumor had been present long enough to cause atrophy of both discs (Fig. 2). This phase of the subject might be illustrated *in extenso* but enough has already been said

Deschamps, *Revue*, 1, 1909, p. 6.

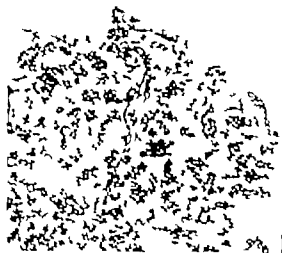


Fig. 2. Histological drawing of portion of adenoma removed from patient in whom there was no evidence of acromegaly or any other tissue change. The tumor had been present long enough to cause atrophy of both optic discs.

to show that there is the widest variation in the clinical expression of pituitary lesions that the hyperplastic or the dystrophic type, either separately or in conjunction may owe their origin to the same lesion and vice versa, a similar lesion may be accompanied by neither type. These remarks have been introduced not to suggest any discussion of the physiology of the gland either in its normal or perverted state, but merely to call attention to the fact that prior to operation the surgeon can surmise nothing of the character of the lesion with which he may have to deal.

The naked eye appearance of the growth as described by the operator is of no value whatsoever except in those cases in which the tumor is a simple cyst. Thus in the operative notes of a number of cases taken at random we find the following phrases:

Description of tumor at operation	Histological report
Cystic structure with gelatinous contents removed	Hyperplasia
Dark red tumor size of cherry	Hyperplasia
Cyst size of hazel nut evacuated and removed	Chordoma
Soft grayish red mass	Round-celled sarcoma
Soft grayish mass	Fibroma
White tumor mass	Adenoma
Gray tumor size of cherry	Adenoma

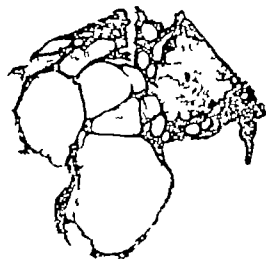


FIG. 3. Histological drawing from sarcoma of the pituitary body removed from patient whose illness covered period of at least two years. The growth confined to the sella turcica, did not involve any adjacent structures nor did it give rise to metastasis.

Further obstacles are met in an attempt to draw deductions based upon the type of tumor because of the difficulty in determining its precise nature. Thus, even with experienced pathologists differences of opinion will be found as to whether a given tumor is an adenoma or a sarcoma, a benign adenoma or a malignant adenoma, an epithelial sarcoma or a carcinoma. In a report recently rendered upon one of my specimens it was stated that

there is undoubtedly an adenomatous condition here with grossly distended spaces lined with epithelial elements and filled with a faintly staining acid material strongly suggesting the colloidal-like substance seen in hyperfunction. Added to this there are undoubtedly plugs of epithelial cells of the type of the glandular elements together with some overgrowth of the connective-tissue cell elements. The diagnosis would therefore be adenoma with a possibility of adeno-carcinoma though the latter diagnosis would be open to dispute.

As to the life history of these tumors it is rather interesting to observe that even with those of a malignant nature there may be no evidences either of recurrence or metastasis for a number of years (Fig. 3). Quoting from

the series of von Eiselsberg (loc. cit.) there was one case of adeno-carcinoma where even five and a half years after operation there was no evidence of recurrence another of angio-sarcoma with no evidence of recurrence four and one half years after operation, one of carcinoma in which over a year had elapsed, and one characterized as an epithelial tumor of a malignant nature where after two and one half years there were no signs of recurrence. While at the present time pathologists often disagree in their histological diagnosis the fact remains that in its life history there is not the same distinction between the benign and the malignant tumor of the hypophysis as there is between similar lesions in other organs. Recognizing the many obstacles that arise in the surgical treatment of pituitary lesions, we have at least an encouraging feature in the fact that though the tissue removed may be malignant the benefits derived from a given operation may continue over a number of years and this in face of the fact that in few if any operations has anything approaching a radical or complete removal been accomplished.

The size and the extent of the tumor is a matter of importance more especially when we come to consider the question of approach and the manner of dealing with pituitary disorders on the operating table. The alteration in the conformation of the sella turcica as revealed by the radiograph is of great diagnostic value and when the sella is much enlarged we can prognosticate in a measure as to the size of the tumor (Fig. 4). But unfortunately changes in the sella turcica are by no means always present, and whether small or large the tumor may extend upwards some distance from the floor of the sella in various directions. In none of the operations by the transphenoidal route can any exact estimate be made as to the extent of the lesion although the same cannot be said of the transfrontal approach. In one operation by the transphenoidal method it is recorded that a yellowish white tumor the size of a small nut was exposed and partially removed at the autopsy twenty-four hours later the tumor was found to extend into the frontal lobe.

The location of the hypophysis in relation to the tumor has been investigated in the hope of securing further data in the problem of how best to approach the hypophysis—that is, from the inferior or from the superior aspect of the tumor. Accurate descriptions of this relation in autopsy findings are somewhat meager but several records have been found in which this relation is accurately described. In these the relation is described somewhat as follows: The principal portion of the tumor was found in the sella turcica over the markedly flattened hypophysis or the tumor had compressed and markedly flattened the hypophysis or the hypophysis was flattened out against the wall of the sella turcica. From an investigation of available pathological records, one gets the impression that in the development of tumors of the hypophysis the gland occupies a position on the floor or wall of the sella and is not so much displaced upwards by the growth but rather flattened out against the floor of the sella. If the assumption be true the hypophysis itself would be least subject to trauma if it were approached from the superior rather than the inferior aspect.

The observations already made and about to be made are based upon a careful analysis of the records and findings at 74 operations for pituitary lesions gathered from various sources. In this list only those cases are included in which the diagnosis was confirmed either at the operation or autopsy and excludes cases in which the symptoms were due to tumors of adjacent structures not involving directly or primarily the pituitary body. The character of the lesion has been arranged in tabular form (Table I) and of the total number there were 14 cases of struma, 22 of adenomata, 6 of carcinoma, 10 of sarcoma, 2 of cysts, 1 cystic tumor, 5 miscellaneous and 4 not designated.

With this survey of the character of the lesion to be dealt with, we come to the phase of the subject that is of most concern to the surgeon. Under what circumstances shall we operate and what is the most appropriate method of approaching and dealing with the lesion.



Fig. 4. Skullgraph taken of one patient in my series in which there was no unusual enlargement of the sella turcica. The operation revealed, however, a large cyst extending well beyond the confines of the sella. In this case, as in other cases, no estimation of the size of the tumor could be prognosticated from the radiograph.

TABLE I

(CHARACTER OF LESION)

Hyperplasia		
Struma (chromophobe)		4
Adenoma	5	
Cystic		
Pillary		
Malignant	4	
Carcinoma		
Epithel-carcinoma		
Epithelioma		
Adeno-epithelioma		
Malignant tumor		6
Sarcoma		
Round-celled	4	
Penthetal	4	
Angio		
Cyst	8	
Cystic tumors		
Miscellaneous	3	
Teratoma		
Mixed teratoma		
Chordoma		
Fibroma		
Tumors (not designated)		5
		4
Total		4

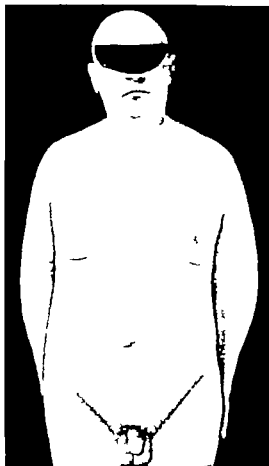


Fig. 5 Photograph of patient with acromegaly and sexual impotence. The operation upon this patient was performed not because of these symptoms alone but for the relief of continuous headache and failing vision.

I should preface these remarks with the statement that the surgery of pituitary disease is still in the developmental stage, and that the opinion we may now entertain must be regarded as tentative and by no means final. There is still not enough data available to estimate with any degree of accuracy how long the improvement which follows operation in many instances will last. This is a phase of the subject which must be given consideration in formulating our views as to the indications for operation.

There are four features of pituitary disease for the relief of which operation might be

considered: acromegaly, accumulation of fat and sexual impotence, disturbances of vision and headache. In view of the gravity of the procedure, I doubt very much whether we are justified in operating solely for the purpose of arresting the changes of acromegaly. That is to say, unless there are other symptoms of a more distressing character such as impending blindness and violent headache we are scarcely justified in resorting to so formidable a procedure as an hypophysectomy. On the other hand with the clinical triad of headache, impending blindness and acromegaly, some means of intervention should be resorted to for the patient who seeks relief. The mere acquisition of fat with sexual impotence is another phase which of itself scarcely justifies resort to surgical therapy (Fig. 5) at least until the influence of glandular feeding has been given a thorough trial. The character of the operation selected to meet the various clinical syndromes will be discussed further on.

Technique. Where an exploratory operation is contemplated the question at once arises as to the method of approach. By far the majority of operations have been performed by the transphenoidal route 64 out of 74, but my experience with four operations for pituitary disease within the past year by the transfrontal route has lead me to adopt it as possessing certain points of superiority.

Krause¹ was the first to suggest approaching the hypophysis through the anterior cranial fossa; he resected the frontal bone and proceeded extradurally until the lesser wing of the sphenoid was reached; at this juncture the dura was incised and the hypophysis easily exposed. Borchard tried to remove a hypophysial tumor by the above method, but was obliged to abandon the operation because of hemorrhage. Killian² elaborated Krause's technique somewhat and advocated immediate incision of the dura. In 1911 Bogojawlemsky³ performed an operation through the anterior cranial fossa with satisfactory result, and in 9 McArthur⁴ elaborated a technique for the transfrontal route; the essential fea-

¹ Deutsche Klin. 1904, vol. 1904.

² Zentralbl. Chir. 1906, 1907, 1123.

³ Ann. Surg. Phila. 1904.

⁴ J. de Chir. April 1904.

⁵ J. Am. M. Ass. 1904, June 29.

ture of which was the temporary resection of the frontal fragment and a portion of the orbital roof.

Technique of transfrontal approach. The method which I have adopted is a modification of McArthur's, in that an osteoplastic flap is reflected and the segment resected is of smaller dimensions, consisting only of the supra-orbital ridge and a portion of the orbital roof. The following is a description of the various steps. Prior to the operation the frontal sinuses are outlined by transillumination as I have found this method more accurate than the stereoscopic radiograph. It is desirable, when possible to avoid opening the sinuses, and if one is smaller than the other this determines the side on which the operation is to be performed. In some instances the sinuses on both sides are so large that one cannot avoid them, and while thus far it has not seemed to affect the process of repair and the healing in of the resected orbital segment, the presence of the open sinus seemed to me to be a potential source of infection. In one of my cases the sinuses were unusually large communicating freely with each other and extending outward as far as the external angular process (Fig. 6). At that stage of the operation in which the osteoplastic flap had been reflected and the supra-orbital ridge with the large sinus resected I decided to proceed no further restored the flap and fragment to their natural relations, and closed the wound. The wound healed without complications, the resected fragment became firmly attached to its adjacent surfaces, and later on I repeated the operation on the opposite side exposed and removed a portion of an adenoma of the pituitary body.

The first limb of the incision begins at the external angular process (Fig. 7) follows the line and curve of the eyebrow to the median line at the root of the nose the second extends from this point directly upward until a point is reached one inch within the hair line the third continues within the hair line down to a point on the level with the external angular process. As a tourniquet cannot be used in this as in other craniotomies hemostasis must be effected with the aid of Allis forceps and hemostats. The cutaneous margins are



Fig. 6 Radiograph showing the characteristic enlargement of the sella turcica and unusually large frontal sinuses which extend upwards as far as the external angular process.

then reflected sufficiently to expose the cranium 2 cm. from the median line to avoid the pachyionian bodies and 2 cm. above the supra-orbital ridge. Two openings are made with the Hudson drill on either side of the base of the flap and with the spiral osteotome the osteoplastic flap is freed and then reflected.

The supra-orbital ridge is then divided (Fig. 8) using a Heys saw rather than a chisel or osteotome as the former makes a very smooth, even section, to the outer side just within the external angular process and to the inner side at a distance of from 2 or 3 cm. from the median line according to the outer limitation of the frontal sinus both sections being made obliquely so that the resected portion is wedge-shaped (Fig. 9) and when replaced fits snugly in its place and can not easily be depressed or dislodged when

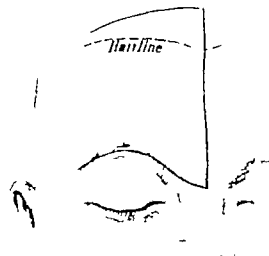


Fig. 7. Drawing showing the relation of the incision to the eyebrow and the hair line.

subjected to the pressure of the dressing and bandage. Thus the contour of the supra-orbital ridge is perfectly restored. When the bone has been divided through the orbital ridge it is grasped with a pair of sequesterum forceps and pried loose, carrying with it a portion large or small of the orbital roof. (This fragment is kept in normal salt solution at body temperature until the wound is to be closed.) The periosteum must then be separated from what remains of the orbital roof and this must be done with great care and gentleness, since if torn, as it may readily be, the rent is difficult to close and further steps of the operation are hampered by the herniation of the orbital fat into the avenue of approach. After the periosteum has been freed, what remains of the orbital roof is removed with rongeur forceps down to, but not including the margin of the optic foramen. The latter step is not necessary, and is more or less tedious in its execution.

At this stage preparation is made to open the sella turcica. Earlier in the course of the operation a small opening is made in the dura in order to allow the cerebro-spinal fluid to escape freely and allow of greater displace-



Fig. 8. Drawing showing the reflection of the osteoplastic flap and retention bars (a) and (b) the portions of the supra-orbital ridge to be reserved.

ment of the frontal lobe. With suitable retractors, the orbital contents are displaced downward and outward and the frontal lobe elevated until a view is obtained of the optic nerve as it passes from the optic foramen to pass on toward the sella. The exposure of the optic nerve is essential as a guide to the next and important step, the incision in the dura (Fig. 10). The dura is incised in a horizontal direction about a centimeter above the base of the skull for a distance wide enough to admit of the blade of a retractor and to expose the content of the sella. The subsequent steps of the operation depend upon the character of the lesion to be dealt with.

Comparison of methods. When we compare the various methods of approach we must take into consideration that by the extracranial method most of the fatal issues have been due to meningitis, and while by the submucous resection of the septum the dangers of infection are minimized, the chances of infection through an avenue of approach as difficult to disinfect as the nasal cavities will always be greater than by any of the intracranial operations. Whether one uses the



Fig. 9. Fragment of bone including supra-orbital ridge and portion of orbital roof temporarily resected.

technique of Kanavel Halstead Cushing or Hirsch, the difficulties of working in so contracted a space and the limited exposure of the field are serious obstacles at least to the general surgeon. It seems to me of the extracranial methods that von Eiselsberg's technique is the most appealing even though the cosmetic results are not as desirable and von Eiselsberg's commentary on all the endonasal methods strikes me as very much to the point, when he says that it remains to be seen whether the intranasal procedures which require the peculiar technical skill of the specialist, are to be left in the realm of the rhinologist rather than in that of the general surgeon. As a matter of fact it remained for the specialist Hirsch, to develop the technique of submucous resection, and to complete the operation without the use of a general anesthetic. Again by the intracranial or transfrontal route there is the advantage of being able to determine with a greater degree of accuracy the extent and operability of the growth. There are records of 12 cases in which the greater portion of the tumor was extra-sellar and encroached upon one or both of the cerebral hemispheres. Of sixty-four tumors operated upon by the extracranial method there were twenty-four deaths, and the autopsy in twelve cases showed that the tumor extended some distance beyond the confines of the sella turcica. Whether these growths will prove to be operable remains to be seen. In none of the cases of my series have there been any of this character. While one should not lay too great stress on the cosmetic results when such grave symptoms can be alleviated as

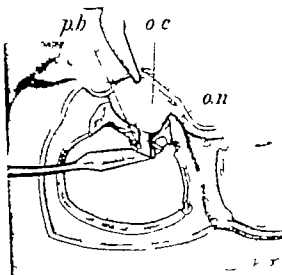


Fig. 10. With the head in the Rose position, after the supra-orbital ridge and what remains of the roof of the orbit have been removed, the frontal lobe is elevated with retractor and the orbital contents are displaced downwards, exposing the optic nerve and immediately to the left of it, the pituitary body: o. n., orbital contents; p. b., pituitary body; o. c., optic nerve.

those accompanying hypophysial lesions, nevertheless due consideration should be given to this phase of the subject in selecting the method of approach. I cannot but feel that the cosmetic effect of the transfrontal approach leaves nothing to be desired. After the lapse of a few months I have found the scar in the median line is scarcely visible (Fig. 11).

Indications for operation. Leaving aside a discussion of the relative merits of the extracranial or intracranial procedures consideration should be given to the special indications, if there be any for purely palliative procedures, either by the so-called sella decompression or by the conventional temporal decompression. There are available in the 74 cases that form the basis of this review records of 8 cases in which a temporal decompression was performed. In 3 instances no further intervention was resorted to 2 of the patients living two months after the decompression with a very slight amelioration of the symptoms during the first part of the period the other died in six hours from respiratory failure. The lesions as verified later by autopsy



Fig. Photograph of patient taken year after evacuation of cyst of the hypophysis, showing the inconspicuous character of the scar after the transfrontal approach to the sella turcica.

were respectively teratoma, struma, round celled sarcoma. In the other 3 instances, there was improvement in one case for 1 month, when a radical operation was performed and a cyst evacuated, in another there was slight improvement for 7 years at the end of which period a struma was partially removed by operation. In 3 cases no improvement followed temporal decompression. In one instance it was both preceded and followed by a radical operation, at which a chromophobe struma was partially removed. In one case after the condition had remained unaltered for a month it was followed by a radical operation and the evacuation of cyst, after which latter procedure there was marked improvement—restoration of vision after almost complete blindness. In yet another instance when two months after a radical operation and partial removal of struma no amelioration of the symptoms had taken

place a temporal decompression was resorted to, but to no avail. While no doubt temporal decompression will relieve for a while the symptoms of general intracranial tension it will not prevent visual disturbances and ultimate blindness, nor can it influence the symptoms that arise from disturbance of the pituitary function. The scope of this operation is necessarily limited.

The mere removal of the floor of the sella turcica would seem to possess greater merit. If we assume at the outset that the great majority of pituitary lesions are inoperable from the surgical viewpoint, we must acknowledge that all the transphenoidal methods have at least this advantage to their credit, since as von Eiselsberg says, their principal feature lies in the fact that we are able to establish a decompression and coincidentally remove a piece of the tumor or evacuate a cyst. I have been able to find only 3 instances in which sellar decompression was performed in this series of 74 cases, in which the lesion was verified either at operation or autopsy. Of these 3 cases, there was one case of acromegaly in which a sellar decompression was followed by slight improvement over a period of six months. A fragment of tissue removed at operation classed the lesion as a struma. In another instance, in which a fragment was removed at the time of the opening in the sellar floor the condition remained unaltered during the four following months. The third case was followed by death in 24 hours, and a struma was reported by the histological examination. Sellar decompression may be indicated, as Schuller suggested, merely as a diagnostic measure, for even though there may be symptoms of glandular disturbance these may be due to extra-hypophyseal lesions, as in one of Hirsch's cases in which there was a hydrocephalus and the hypophysis proved to be normal. In 4 cases in which the lesion has never been certified slight amelioration of symptoms followed the sellar decompression for a period of from 3 months to one year. As a matter of fact, sellar decompression has not proven to have more than a very transitory influence on the course of the disease.

Results of surgical therapy Taking our series of 74 operations of strictly pituitary lesions, what can be said of the effects of surgical therapy with or without glandular feeding? The results have been carefully analyzed from the standpoint of the pathological lesion, the clinical syndrome exhibited before the operation, and the character of the latter as to immediate and ultimate effects.

First of all, with reference to the character of the lesion, the prognosis is most grave in the cases of sarcoma, and most favorable in the cases of cyst (Table II). Of 9 cases of sarcoma, in one there was temporary improvement in one improvement continued over two years, and seven died. On the other hand, in eleven cases of cyst seven were improved and only three died.

The size of the lesion as well as its character influences the prognosis as would appear from the fact that in 12 of the 24 deaths in 64 extracranial operations, the autopsy revealed an extensive growth beyond the sella turcica.

Of the total 74 operations by various operators, there were 29 deaths, a mortality of 39.1 per cent, but these figures do not give a fair estimate of what may be accomplished by individual surgeons who have had larger experience; thus, von Eiselsberg's mortality in 16 cases was 25 per cent. and Hirsch's in 14 cases, 21.4 per cent. In the 4 successive intracranial operations in my own series, there were no fatalities. Naturally in the developmental stage of any new surgical undertaking the mortality will be high until experience perfects in technique and selection of cases combine to minimize the operative risks.

If we analyze the results of surgical interference according to the clinical syndrome, it appears that in 24 cases of the dystrophy group (adiposo-genitalis dystrophy) 15 were improved, 4 beyond the two-year limit, 1 temporarily improved with relapse and 8 died. In this group there were



Fig. 2. Radiograph of patient showing the unusual widening of the sella turcica in a case in which the symptoms of hypophysial disease entirely disappeared after the administration of thyroid extract.

Similarly in the 26 cases of the acromegalic group 14 were improved, one beyond the two-year limit, 1 unimproved and 11 deaths. In this group there were

Hyperplasia	CASES
Struma	3 CASES
Adenomata	CASES
Sarcoma	5 CASES
Carcinoma	CASES
Cysts	CASES
Fibroma	CASE

26

Of those exhibiting only symptoms of general intracranial tension, 13 were improved, 2 unimproved and 9 died. Of these there were

Struma	4 CASES
Adenomata	6 CASES
Carcinoma	CASE
Sarcoma	CASES
Cysts	4 CASES
Miscellaneous	7 CASES

4

Struma	7 CASES
Adenomata	5 CASES
Cysts	5 CASES
Teratomata	CASE
Sarcoma	3 CASES
Carcinoma	3 CASES

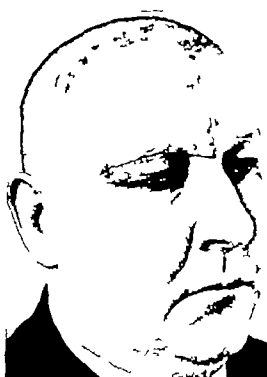


Fig. 3. Photograph of patient, taken two weeks after operation by the author's transfrontal method of approaching the sella turcica.

The most instructive of our analytical tables is that which deals with the symptoms which responded in any way to surgical intervention. By far the largest percentage of improvements was noted as one might expect in the visual disturbance (18 in 74 cases) next in order was the relief of headache (18 in 4 cases) there were only 5 instances out of 23 in which adiposity was favorably influenced and in but 8 in 26 cases of acromegaly were there evidences of improvement. The statistics must not be given too much weight in the final judgment of the accomplishments of surgery since in many instances the reports were published but a few months after the operation was performed, and in certain instances the damage to the optic nerve was such that recovery of vision was out of the question. Furthermore the estimation of the benefits of operation is not complete unless one takes into consideration the effects of the supplemental treatment by glandular feeding.

There are on record instances of the very positive influence of glandular feeding upon various symptoms. One of the most striking of these was in a case of a young woman whom I saw with Dr G. E. de Schweinitz.¹ There was intense headache and nausea, enlargement of the sella turcica, cessation of menstruation, bitemporal hemianopsia first for colors and later for form followed by a gradual disappearance of the entire visual field, with total blindness of the right eye, lasting twelve days, and of the left eye lasting six weeks (Fig. 12). After months of treatment, there was complete restoration of vision as the result of the administration of large doses of thyroid extract associated with injections of unguentum hydragryum. In my own series there was one case in which after the partial removal of an adenoma the administration of pituitary extract was followed by improvement in vision, relief of headache, and recovery of the sexual function. In another after the partial removal of an adenoma, headache disappeared and the somnolence was very much less pronounced. As the optic nerves were already atrophied, restoration of vision was out of the question.

Personal experience. My experience with the radical operation for pituitary lesions has been limited to four cases. In each the sella turcica was approached by the intracranial (transfrontal) route.

CASE 1. In one case of the dystrophic type (Fig. 1) large pituitary cyst as readily exposed and evacuated. The convalescence was uneventful and there was improvement of the visual disturbance and headache.

CASE 2. as that of middle-aged man, he had many of the symptoms of hypoplasia of the gland, moderate increase in weight, loss of hair and sexual function, headache and nasal disturbance. The sella as filled with a mass, portion of which was removed and proved on examination to be sarcoma (Fig. 3). Following the operation glandular feeding was instituted and as result of the combined effect, the headache, nasal and sexual disturbances were favorably influenced.

CASE 3. as Case 4 exhibited only evidences of intracranial tension, although in both the pituitary body as the seat of tumor in one an adenoma, and in the other sarcoma. I both unfortunately

¹ De Schweinitz and Hollenhorst. J. Am. Med. Ass. Sept. 19, 1911.
 Dr. J. Am. Med. Ass. published in Dr. H. K. Allen, N. Y. 1911.
 Dr. Allen will report this case more fully at the next meeting of the Association.

the optic nerve was atrophied at the time of the operation. Glandular feeding was instituted in both. Somnolence was conspicuous feature in both. The patient slept most of the time day and night but since the operation he has been out of bed in daylight hours and intellectually is very much more alert. The fourth of the series is only the convalescent stage and final report to the effects of the operation must be held in abeyance (Fig. 14).

Summary I have tried in this rather lengthy discussion to emphasize certain features which seem to me worthy of attention and consideration at this juncture in the development of pituitary surgery. The lack of unanimity of opinion as to the function of the pituitary gland as essential to life, the very variable clinical expressions of pituitary disease, the difficulty in the pathological classification of pituitary tumors, or in determining the extent or character of the lesion prior to operation, and more especially the relatively benign character of tumors histologically malignant.



Fig. 14. Photograph taken during the convalescence of patient after the removal of sarcoma of the hypophysis by the transfrontal approach. The contour of the supra-orbital ridge has been fully restored and the scar is scarcely visible.

TABLE II

	Total	Improved	Unimproved	Death	Temporary improvement	Final improvement
Hyperplasia						
Stroma	4	0				
Adenoma				8		
Carcinoma	6			3		
Sarcoma				7		
Cysts		7		3		
Teratoma	3					
Chorioma						
Fibroma						
Tumors	4	3				
	74	36		20		5

TABLE III

	Total	Improved	Unimproved	Death
Temporary improvement	36	3	5	
Unimproved				
Death	20	4		3
Improvement by relapse				
Improvement beyond years	5	5		
	7	64	7	3

TABLE IV

SYMPTOMS RELIEVED BY OPERATION

	Adiposity	Acromegaly	Visual Disturbance	Headache	Mental Disturbance
Dystrophy group (14)	5			7	
Acromegaly group (26)		8	8	4	
Intractable tension (24)			9	7	
	5	8	8	8	4

TABLE V

CHARACTER OF LESION IN CASES CLASSIFIED ACCORDING TO CLINICAL SYNDROME

	Dystrophy	Acromegaly	Leptocoma Tumors	Total
Stroma	7	3	4	4
Hyperplasia				
Adenoma	5		6	
Sarcoma	3	5		
Carcinoma	3			
Cysts	5		4	6
Miscellaneous			7	9
	24	26	24	74

I must concede to surgery as yet a comparatively limited field in the treatment of pituitary disorders. Glandular therapy including the use of both thyroid and pituitary extracts, should be given a fair trial, at least until vision is threatened or the progress of the disease has proved to be uninfluenced. There does not seem to be any future for purely palliative procedures, particularly temporal decompression, and if operation is to be resorted to it should consist in an attempt at the removal of a considerable portion of the tumor. There are well substantiated records to show that in the accomplishment of this, the beneficial effects of the operation may

extend over a period of at least five years. There is little evidence yet to show that the operation will be followed by a complete retrogression of the effects of perverted tissue metabolism although they may be arrested and other subjective symptoms such as headache, impending blindness, somnolence, and psychic disorders relieved. Therefore operation should not be delayed too long. As to the choice of procedures, I advocate the intracranial transfrontal method as being freer from the risk of infection, affording a better exposure, and better adapted to the gross pathological relations of the lesion.

THE PROBLEM OF INTESTINAL STASIS¹

BY A. E. ROCKEY M. D. PORTLAND OREGON

CAREFUL clinical observation is convincing me day by day that the question of intestinal stasis and its consequent morbidity is one of the most important subjects before the medical profession at this time. Constipation in greater or less degree afflicts a surprisingly large number of people. In some its results appear to be trivial but in a considerable number it is a definite cause for occasional or chronic illness.

The large intestine is a reservoir for the feces. The contents of the small intestine are liquid. In their passage through the large intestine much of the liquid is absorbed. The most important part of digestion and assimilation has taken place in the stomach and small intestine. The residue which is poured into the large intestine for storage and further concentration is of minor value in nutrition. The longer the contents of the large intestine are delayed in their evacuation the more they are subject to bacterial decomposition. Some of these may be harmless, but some are harmful by the production of noxious toxins, which are absorbed along with the liquid portion of the feces. By reason of its size, length, and structure the large intestine is adapted to retain the fecal contents for a considerable period of time and its evacuation is largely under control of the will. There are certain variations of form and position which tend to prolong the period of evacuation. These variations are congenital or acquired. The congenital variations have been quite fully described by Huntington and the acquired variations by Glennard Lane and Jackson. The most common variation is midline ptosis. I shall not at this time discuss the causes of ptosis.

As to the symptoms of ptosis, they may be considered in two classes. First the pain and other symptoms of the ptosis itself and second, the symptoms of stasis. The symptoms of gastric stasis I shall not enlarge on here. The symptoms of intestinal stasis aside from constipation and discomfort are

the symptoms of autointoxication from the pernicious intestinal absorption.

Ptosis is undoubtedly a cause of stasis in many cases and stasis by its interference with nutrition and by its mechanical elongation of the colon is probably a frequent cause of ptosis. But ptosis is found without stasis, and stasis is found without ptosis.

Stasis does not necessarily mean constipation. There are a few cases of marked intestinal autointoxication without constipation and there are many cases of constipation where the autointoxication is only occasional and transient. Such apparently paradoxical cases are illustrated by Figs. 3 and 20.

Cases in which autointoxication with constipation persists in spite of medical and dietetic treatment are commonly cases for surgical treatment. The cases in which constipation exists without autointoxication are as a rule cases that are curable by medical and dietetic treatment.

The treatment of ptosis and stasis is prophylactic, hygienic, dietetic, medicinal, mechanical and surgical.

The surgical treatment of ptosis is the fastening up of prolapsed viscera.

Many symptoms, both gastric and intestinal, ascribed to ptosis are symptoms of stasis and clear up when the stasis is relieved and do not necessarily clear up when the ptosis is relieved or especially when attempts are made to relieve it.

The surgical treatment of intestinal stasis is the anastomosing of the lower end of the ileum with the upper end of the rectum the short-circuit operation of Lane.

When Metschnikoff announced that senility was due to the toxic effect of the absorption of the products of pernicious decomposition in the colon his opinion was received with a generous smile. No less startling had been his previous discovery of the phagocytic power of the leucocytes. That also had been received at first with a considerable degree of incredulity. It was, however so speedily

confirmed by many other investigators that clinicians welcome it as explaining the phenomena of leucocytosis in acute infective conditions. An important function of the phagocyte is to remove dead cells of the body tissue. Whether these cells are destroyed by trauma or the results of infection it is the leucocytes that act as scavengers to clear away the debris. The necrosis produced by infection is the result of the toxins developed by pathogenic bacteria. The infection is virulent only by reason of the destructive effect of these toxins. With pathogenic bacteria these tissue necrosis effects in the acute infections are local and general. Tissue necrosis takes place in the immediate vicinity of the infection. The remote constitutional effects may be manifest as nephritis or general tissue debility. Metchnikoff explains some cases of deafness by saying that intestinal toxins destroy parts of the auditory apparatus and then the phagocytes remove it.

There are some other toxins whose remote effects in producing tissue necrosis are more marked. Post-diphtheritic lesions are good examples. Here the focus of infection may be limited to the throat, or in the case of experimental diphtheria in a guinea pig or rabbit, to a zone in the immediate vicinity of the site of inoculation. The remote effects, however, are seen in necrotic and hemorrhagic patches on the liver or on the sheaths of the nerves. In a measure the tissues frequently show a selective action for certain poisons. The action of wood alcohol on the optic nerve will illustrate this. These remote destructions of tissue are sudden or slow in proportion to the virulence and dose of the toxin. In diphtheria or wood alcohol they are sudden. In chronic suppuration or in lead poisoning they are slow.

Exactly similar is the poisoning from intestinal auto-intoxication. It may be acute in both its local or constitutional effects for example in an acute cholera morbus, or in that symptom complex popularly designated as a bilious attack. These conditions are transitory and the system quickly recovers. Not so however when the disorder is dependent on continuous auto-intoxication. The result is a chronic auto-intoxication with destructive effects on the tissues, which,

though vastly more varied are as definite as those of chronic lead poisoning.

It will suffice to call your attention in detail to a few of the remote constitutional effects now fairly attributable to chronic intestinal auto-intoxication. Prominent among these are nutritional disturbances. An early result is loss of appetite, poor digestion with a consequent loss of weight poor circulation cold hands and feet, nervousness, restless sleep, a marked tendency to localized pains in various parts of the body, sallow complexion, and a general decline of health. Localized changes in the tissues may now follow Nephritis, hepatic cirrhosis, myocarditis, arteriosclerosis, rheumatoid arthritis and the like, have been so frequently mentioned that it is scarcely necessary to repeat the list. Enlargement of the thyroid gland is not rare in this class of patients. This may be either cystic or of the exophthalmic type. Lane has called attention to the frequency of cystic degenerations in the breasts of women of this type and I have been able in a number of instances to confirm his observations. He also considers duodenal ulcer an occasional sequence of stasis. Startling as this claim is, I am beginning to believe it. Within the past year I have operated on several cases of acute perforating duodenal ulcer and invariably they gave a history of chronic constipation.

One of these men 27 years of age and in general good health, though slender in build, ate heartily breakfast and then went to his usual work. At ten o'clock he was seized with violent abdominal pain. The obvious remedy large drink of whiskey was kindly administered by neighbor. Home he was sent when a physician was called, he promptly diagnosed the perforation and brought him to the hospital. At operation small perforation was found in the first portion of the duodenum. This was sutured and the abdomen cleansed with moist sponges. While doing this I found that the colon was very much elongated. The transverse colon could easily be drawn to the pelvis. The sigmoid as long that I was able to bring the lower loop through the incision onto the lower part of the sternum. The abdomen was closed without drainage. The case being acute one no history of the previous condition had been taken but I remarked to those present that the case was undoubtedly one of extreme constipation. This was found to be the case for some years. It is now taking daily



Fig. 2

Fig. 2 Mrs. B. age 57 Chronic constipation with autointoxication. Extreme nervousness.



Fig. 3

Fig. 3 Mrs. W. age 37 Chronic constipation, thin risk and nervous.



Fig. 4

Fig. 4 Mr. Y. age 37 Height 6 feet, eight 34 pounds Rheumatoid arthritis of severe type for seven years Bowels regular Large short-circuit operation done April 6th. Speedy relief of pain in joints, improvement in appetite and gain in weight.

dose of liquid paraffine for the relief of his constipation, and presently we may short-circuit his colon to cure him.

In the study of intestinal stasis we have to deal both with the clinical and physical side of the condition. A careful consideration of the history of the patient is of the highest importance. That usually begins with occasional constipation finally becoming obstinate then possibly alternating with diarrhoea. Laxative taking in a general way for a greater or less period of time usually precedes the first consultation with a physician. Then comes the hygienic advice, more water drinking and eating of fruits and bulky succulent vegetables, and often times more laxatives. Many times such treatment is successful in curing the patient but oftentimes it results simply in relief the continuance of which depends upon the continuance of the remedies. Family history often reveals similar cases in relatives and ancestors. The intensity of the result of auto-intoxication depends oftentimes on the constitutional condition of the patient. Persons of feeble constitution often follow the downward path of chronic indigestion, auto-intoxication, declining health, and premature senility. There are many curves in this path due to the greater or less efficiency of the methods used to combat the tendency. Prop-

er hygienic and medicinal measures are certainly of great value, and it cannot be denied that many absolute cures are made in this way. It must also be agreed that many cases are not cured.

The local conditions vary much with the cause of stasis. Ptoisis may be general as in the extreme form described by Glennard or it may be a midline ptoisis, in which both the stomach and colon are prolapsed in the center the side supports remaining. In many cases, however as the illustrations herewith presented show the stomach retains its position and the colon alone is prolapsed (Figs. 1, 2, 8 and 13). Ptoisis is by no means a universal accompaniment of stasis. There are many cases of extreme and persistent stasis with only a moderate amount of ptoisis.

Fig. 10 illustrates case of protracted constipation of severe type (about ptosis). This condition has existed for at least 5 years. The patient is 38 years of age. An interesting feature of this case not however connected with her constipation, is that the woman has never menstruated. She has been married 5 years. Her nutrition is good, and the abdomen rather fat. For this reason pelvic examination is not easy. The lower part of the uterus can be palpated, but it is impossible to state definitely whether ovaries are present. Uterine sound enters only 15 inches. Although the lower part of the canal is sufficiently patulous to admit the sound easily it then meets firm resistance which seems

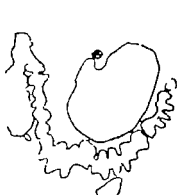


Fig. 4.

Fig. 4. Mrs. S. age 35, eight or 10 pounds. Pain lower left quadrant for years. Moderate constipation. Chronic invagination.



Fig. 5.

Fig. 5. Mrs. T. age 5, weight 99 pounds. Constipa-



Fig. 6.

tion for four years. Severe anastomosis. Lane's short-circuit operation. Cured.

Fig. 6. Mrs. G. age 56. Chronic constipation. Arthritis acetabuli. Invalidism.

to indicate either complete stenosis or the end of a small tumor. The history is one of occasional attacks of transient intussusception. The plate is reproduced for the purpose of showing that severe constipation may exist with high position of the abdominal viscera, and with but slight constititional disturbance.

Stasis may be due to the inhibition of the peristaltic action of the intestines by chronic inflammatory conditions within the abdomen, particularly of those of the gall-bladder or appendix. It may also be caused by the adhesions which have formed as a result of acute inflammatory attacks. This is particularly true of the appendix, but also does not infrequently result from acute inflammatory disease of the uterine appendages when extensive intestinal adhesions have followed.

Some cases of stasis have been cured by the surgical relief of the ptosis, but such operations are by no means a panacea, and failure has frequently followed an attempt to cure in this way. The reason for this must be evident when we examine X-ray pictures of the bismuth meal and see as may be seen in the illustrations, that there are many cases of obstinate stasis with the stomach in a high position, and some cases with both the stomach and colon in normal positions and also a considerable number of cases exhibiting a marked ptosis without stasis.

Fig. 3 illustrates the case of a man 37 years of age, 6 feet tall, and weighing in ordinary street costume but 1/2 pounds. He has daily move-

ments of the bowels, and his urine contains only a trace of indican, but for the past seven years he has suffered from rheumatoid arthritis, that has now produced considerable deformity of the joints and atrophy of the muscles. For the past two years he has been confined to bed, suffering at times great pain. His appetite is poor and his mental condition one of extreme dejection, approaching melancholia. Ten months ago I performed Lane's short-circuit operation, and the most marvelous improvement has resulted. The pain has disappeared from his joints, the mobility has increased to the limit of the anatomical changes that had before existed, his appetite has become almost ravenous, and his mental condition is one of constant good cheer. If not to the short-circuiting of his colon, what other cause can this great change be attributed when his disease had defied all previous treatment. The plate is presented as showing that regular movements of the bowels may exist in the presence of marked ptosis and yet within the colon existed some condition that was producing rheumatoid arthritis.

So common is the downward midline curve that the time has come to question our ideas of what constitutes normal position of the stomach and colon. The drawings of the anatomists are made from the cadaver and illustrate the ordinary position of the organs in recumbent posture after death. The radiograph of the bismuth meal has taught us, however, that the extremely high position which we see illustrated in the books, and which we have been taught to consider as normal, may be the exception rather than the rule. By the data we have accumulated

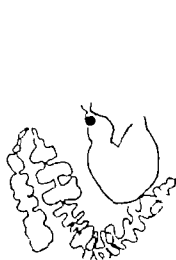


Fig. 7.

Fig. 7. Mrs. S. age 33. Constipated for years. During health. Lane's short-circuit operation recommended.

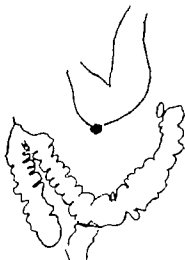


Fig. 8.

Fig. 8. Mrs. S. age 30. Severe constipation. Mucus

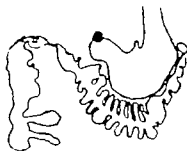


Fig. 9.

in stools. Pain left upper quadrant. Autointoxication ill marked.

Fig. 9. Mrs. F. age 30. Operated for acute appendicitis nine years ago. Frequent severe pain in right lower quadrant since that time. Constipated.

through the examination of X-ray pictures of bismuth meals, even though an undue proportion of these may be of ptosis cases, we must consider that a moderate ptosis may exist without in any way seeming to be detrimental to the general health and may be a normal rather than pathological condition. Mildline ptosis of an extreme degree, while favoring stasis, does by no means universally produce it, and stasis, even of a severe type with all of the malevolent effects of autointoxication, may exist without ptosis.

Constipation may in the beginning be functional, and due to the personal habits of the individual. He is negligent to nature's calls. His hygiene is bad particularly in taking an insufficient amount of fluid. The results are constipation, for the temporary relief of which laxatives are resorted to. The intestine accustomed to this stimulant, fails to respond to the ordinary stimulus and stalls results. Accumulations in the colon tend rapidly to produce not only a constitutional autointoxication, but local irritation in the colon itself. By contiguity of structure this inflammatory condition extends through the walls of the colon, and a pericollitis develops. This results in the throwing out of plastic

material and the formation of pericolic adhesions. These are at first fine and soft, but eventually become well organized, and have definitely developed blood vessels. They serve in a measure to prevent further descent of the viscera, but these adhesions are not always well placed for this purpose. They often produce kinks, and add to rather than relieve the existing stasis. These are the acquired mesenteries of Lane. He considers them due to the tension caused by the downward pull of the viscera—the crystallization of the lines of force." It is indeed quite within reason to believe that the stimulus produced by undue tension might produce a reaction resulting in cell proliferation and that their development might be largely due to mechanical action rather than to plastic exudate produced by toxic absorption. They do not by any means exist in all cases of pronounced intestinal stasis or ptosis, but they are to be found in a considerable number. Lane has called attention to the manner in which such adhesions may produce sharp kinks in the appendix, and thus may be the cause and not the result of either chronic or acute appendicitis. This may explain also the reason of the frequent failure to cure gas-

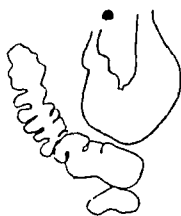


Fig. a.



Fig. b.



Fig. c.

Fig. a. Mrs. C. Severely constipated for years. Several attacks of obstruction that closely simulated ileus. Lane short-circuit operation. Cured. Gain of 18 pounds in three months.

Fig. b. Mrs. V. age 35. Severely constipated for

years. Lane short-circuit operation. Cured. Gain of 30 pounds in five months.

Fig. c. Mrs. B., age 40. Many years of constipation and auto-intoxication. Irradiation. Lane short-circuit operation. Cured.

tric symptoms by the removal of an appendix of this type. The so-called chronic appendicitis which it is here admitted is an actual entity in some cases is in other cases a part of the disturbances that result from stasis, and not the primary cause of it. Where the so-called chronic appendicitis is a secondary result of stasis the sharp kinks observed by Lane will be found. The proximal portion between the first kink and the cecum will be found normal but the distal portion may be either dilated and contain mucus, or may be the seat of a more or less chronic or acute inflammation. The formation of enteroliths beyond this point with their consequent pressure necrosis and acute inflammation are then a secondary result of the pericolicitis produced by the stasis.

Indican in great excess appears in the urine of many patients in whom auto-intoxication is well marked. This substance has received attention chiefly on account of the ease with which it is detected by a vivid color reaction. More careful examinations, however have shown that indican is only one of a group of toxic substances which are absorbed from the intestinal tract in stasis cases, and produce by their constant presence detrimental effects upon the tissues. It must be considered as the flag of the enemy rather than the whole

army and its elimination from the system before absorption takes place must be regarded as securing elimination of other toxic substances which go with it. Whether this be accomplished by improved hygiene, or by facilitating the movement of the intestinal contents by the mechanical device of Lane's short-circuit operation the protection of the system is assured, and improvement of the patient's condition follows. The frequent appearance of excess of indican in the urine must be regarded as significant, particularly so when it is associated with constipation and general abdominal pain, symptoms which frequently indicate the development of chronic pericolicitis which results in the formation of adhesions and the development of the symptom complex, commonly attributed to intestinal indigestion. Persistent indicanuria is sometimes observed in lesions of the mucosa of the gastro-intestinal tract as in gastric or duodenal ulcer or chronic appendicitis diverticulitis, or in neoplasms of the large intestine. Any of these may however be secondary results of stasis. It is quite certain also that the frequent appearance of an excess of indican antedates the occurrence of the actual lesion. It accompanies the primary irritation on which the lesion forms.

The position, form, and time of passage can



Fig. 3

Fig. 3. Mr. J. age 40. Constipated six years. Lane short-circuit operation. Cured.



Fig. 14.

Fig. 14. Mrs. B., age 43. Alternating diarrhea and constipation. Autointoxication. Lane short-circuit operation.



Fig. 5.

Fig. 5. Mrs. K. Weight 94. Age 4. Severe vomiting and constipation. Autointoxication. Lane short-circuit operation. Cured.

readily be ascertained by the radiographic examination of the bismuth meal either by the screen or plates. In plate examinations of stasis cases, a large dose is given, and twenty-four hours later before the picture is taken a smaller dose given. The outline of both stomach and colon is then taken on one plate.

The tracings which I show you are enlarged by placing a net of squares in front of the plates in the illuminator and drawing the pictures over similar squares ruled by fine lines on the paper. This method gives a definite accuracy so that the outlines here shown represent the shadows produced by the bismuth on the plates. The distribution is at times exceedingly peculiar and some times requires an understanding interpretation though in the main they definitely show the position, size, and shape of both the stomach and colon.

It may be well for us to consider the clinical side of this subject as emphasizing our idea of the theoretical side.

Fig. 1 illustrates the case of woman 35 years of age, who had for many years been suffering from a most obstinate type of constipation. Enormous doses of laxatives were constantly required. In addition to this she was obliged to resort to enemas, very commonly in the lying position. A considerable portion of her time each day was given to securing movement of the bowels. This was

necessary in order to keep her in any degree of health and comfort. In spite of this she declined steadily in health until finally secondary vomiting supervened. Before she came under my care vomiting had been frequent indeed almost constant, for period of six weeks. When the picture I show you was made, she was so weak that it was with difficulty that she could stand long enough to have the plate holder adjusted and the exposure made. After the picture was made she was sent to the hospital and as the frequent vomiting had so much reduced the fluids in her tissues, it was deemed best to endeavor to improve her condition. This was done by raising the foot of the bed about ten inches and administering sugar solution per rectum by the drip method. The solution we commonly use is tablespoon of ordinary cane sugar to quart of water. This is the routine direction given to the nurses in the hospital, and is more convenient than drachms and ounces. I may say passing that the use of this solution, suggested by my associate, Dr. Barbee, has in my practice almost entirely displaced the use of salt solution by the drip method in all post-operative cases. In the case under consideration this was continued several days. Lane short-circuit operation was then done and the result has been highly satisfactory and I may even say spectacular in the manner in which the patient has been changed to healthy even robust woman. She now has daily movement of the bowels, and from the time of the operation she has not taken a single dose of medicine. The operation was done last September and by April 6th of this year a gain of thirty-five pounds in weight had been noted. There has been corresponding improvement in her color and in general demeanor. In other words, her life has been entirely changed.



Fig. 6.

Fig. 6. Mrs. L., age 65. Weight 95 lbs. Stomach trouble since aged fifteen. N. constipation. N. stasis. Pain left abdomen, especially after meals. Frequent vomiting which relieves pain. Greatly improved and gained weight by abdominal support, feeding and rest after meals. A case of ptosis without stasis.



Fig. 7.

Fig. 7. Mrs. Mc., age 45. Always constipated. Autointoxication.



Fig. 8.

Fig. 8. Mrs. C. Severe constipation and gastric disturbances. Autointoxication.

Fig. 10. Mrs. C. You will note here, in addition to the ptosis of the colon considerable ptosis of the stomach and it is distinctly midline ptosis. The stomach falls into a rather sharp bend in the midline, and it must be evident that in passing out from the pylorus a decided upward movement of the gastric contents must be secured if the patient is in the upright posture. In this case, however it was the intestinal symptoms that were the most prominent. Obstinate constipation with an extreme degree of autointoxication was present. Bad color, sunken eyes, bad face and general appearance of invalidism was present. The constipation became severe obstipation, and on two occasions the attending physicians were about to advise an abdominal operation for acute intestinal obstruction, when further persistence with the use of castor oil and enemata succeeded in moving the bowels. It was just after the second of these attacks that the patient came under my care and I at once advised Lane short circuit operation. At operation we found the typical acquired mesenteries which Lane describes. The results of the short-circuit operation were as marked as those of the previous case. An entire change in the condition of the patient has resulted. This patient lives in neighboring town, and I have seen her but once since she left the hospital. On that occasion, about three months after the operation, she had made gain of 8 pounds in weight. There were daily movements of the bowels, her color had changed from sallow cachectic to healthy pink, and her expression to one which indicated well the full joy of living which she now felt.

Fig. 9. Mr. J. is from patient presenting the following history. Age 40, severely constipated for eight years, then followed by period of three years of comparative freedom from constipation and much improvement in health, and then again constipation of severe type for eight months, during

which he had been reduced to condition of invalidism. He had not been able to do any work. Lane's short-circuit operation was done on this man on the occasion of recent visit of Dr. Yocum. At operation we found the cecum firmly adherent just below the brim of the pelvis. The appendix had rather a sharp kink, but the adhesions seemed to be more retrocecal than as though they had been caused by an acute appendicitis. So firmly as the cecum bound down that the section across the ileum was made nearly an inch further than usual from the ileocecal valve in order to get proper working room. From the time the rectal tube was removed, six days after the operation, to the present time, this patient has had daily movements of the bowels. Although scarcely two months have passed he has made a most rapid improvement in general health. His appetite has become almost ravenous, and the stomach has proved its good condition by promptly taking care of all that is put into it.

Another case, of which we have no picture, illustrates a most interesting case of chronic invalidism due to an intestinal stasis and autointoxication. This woman had in addition to her constipation much pelvic pain, probably produced by chronic salpingitis. For this several years ago an operation was performed, and the right ovary and tube removed. A ventral hernia followed this operation, and her condition was worse than before. The constipation was varied by the occasional occurrence of diarrhoea, and at all times there was an excessively large quantity of mucus in the stools. Eight months ago appendicectomy was done by one of my colleagues on this patient for the purpose of curing chronic colitis by colonic irrigation. An operation was also done for her ventral hernia. This unfortunately failed, and the hernia recurred. The appendicectomy however was successful in enabling her to flush out her bowels. By doing this from each



Fig. 9.

Fig. 9. M. D. age 32. Chronic constipation and dyspepsia for 7 years. Appendectomy six months ago without relief. Autointoxication. Invalidism.

Fig. 30. Mrs. S. age 37. Constipation for 5 years. Occasional attacks of acute autointoxication.

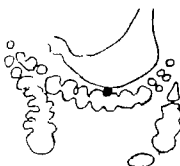


Fig. 30.



Fig. 31.

Fig. 31. Mrs. S. Obstinate stasis. Not relieved by medical treatment, massage, hydropathic treatment including course of olive oil injections. Lane short circuit operation has made complete cure.

to three times a day during the eight months before she came under my care, she was able to keep in condition of tolerable comfort. It is interesting to me to know that in spite of this long-continued irrigation there had been no relief from the mucus coils. In this condition the patient came under my care. A stool which I examined contained the customary long strings of mucus in great abundance. In addition to her extreme stasis and autointoxication, she had deep cervical and perineal lacerations, and evident pelvic disease in the left side. At the same operation I amputated her cervix, which was the site of most extensive cystic degenerations engrafted on very deep bilateral laceration and repaired her perineum. I then opened her abdomen, and found a large hydrosalpinx of the left tube. This was opened. The left ovary the one remaining, contained a cyst the size of an egg. This was opened, and the lining membrane removed. Lane short circuit operation was then done and her ventral hernia repaired. From the time of the removal of the rectal tube six days post-operative to the present she has had regular movements of the bowels, more frequent than normal at first but now two months after the operation entirely normal. The autointoxication symptoms have already entirely disappeared. She has been speedily restored to good health by operation when complete colonic flushing from one to three times a day for eight months had failed.

Fig. 32. Illustrates case showing conclusive results by the failure of most thorough medical treatment and irrigations of all sorts to cure an obstinate stasis that was promptly cured by short-circuit operation. The patient is the wife of a physician,

who is superintendent of a sanitarium, and has had much hydropathic treatment and massage. This included a course of olive oil injections given in the knee chest position. By constant use of such treatment she was barely able to keep out of the invalid class, and at the slightest remission suffered much from a toxication. Lane short-circuit operation has made a complete cure.

Fig. 5. Mrs. K. This illustrates typical case of midline ptosis. The gastric symptoms were

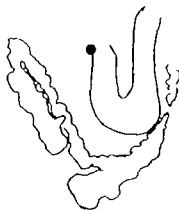


Fig. H.

Fig. H. Mrs. B. Invalid for six years from intestinal stasis. Patient of Dr. F. L. Horsfall. Lane short circuit operation done at Seattle General Hospital, April 25th, before the members of the King County Medical Society. Complete recovery. The patient now has two bowel movements daily.

marked by frequent attacks of vomiting. Malnutrition was pronounced, her weight being but 94 pounds. Constipation had been severe for years and the usual autointoxication symptoms were present. Lane's short-circuit operation promptly restored this patient to health.

Fig. 12 is a case that is interesting in that it exhibited for many years an extreme degree of constipation and irritability of the stomach, in addition to the usual autointoxication symptoms and chronic invalidism. She is the wife of a physician, and had not only the constant counsel and advice of her husband, a most successful practitioner, but the advice of his many medical friends among them being one of national reputation. Three years ago her appendix was removed at a celebrated clinic for chronic appendicitis. It was the site of lesions such as I have described, which are due to the secondary kinks formed by the acquired mesenteries of Lane. There was no relief from the operation. The symptoms increased in severity until her husband gave up his practice and sent with her to southern California for her health. After some months in San Diego the case came under my care. The condition of intestinal stasis and the resulting autointoxication was so evident that a short-circuit operation was suggested and accepted. The result in this case has been the happy transformation of the patient from condition of chronic invalidism to one of perfect health in very short time. The gastric irritability has entirely disappeared. She is now able to eat heartily of any ordinary food, and all the exceptions in her dietary previously necessary have been eliminated. These histories I could reproduce until you would weary of them, but they are sufficient to illustrate stasis cases, and the great efficiency of Lane's short-circuit operation as a method of cure.

The water absorbing function of the colon is better known to surgeons since the use of Murphy's drop method of proctoclysis. The dryness of the colonic contents may be avoided by causing the patient to drink large quantities of water. This constitutes a most important hygienic step in the course of constipation. Liquid paraffine or as it is known in our pharmacopoeia, liquid petrolatum passes through the intestinal canal comparatively unchanged, and is the most efficient lubricant for the colon that can be given by the mouth. In practice it is found that a dose of from one to three ounces, given preferably in a glass of cold water at night, is sufficient to overcome many obstinate cases of constipation during the time that it is used. As the mechanical causes of the constipation are not influenced by the use of this remedy it may be necessary to continue it indefinitely

and it is far better to give a daily dose of just sufficient size to produce a regular movement than to cause a spasmodic movement by the use of a large dose for the purpose of clearing accumulations. When these measures fail to relieve the autointoxication, even though the constipation itself is relieved, Lane's short-circuit operation should be done. Thus I consider one of the most important procedures that has been devised during recent years.

The technique of the operation has been described by Mr. Lane in a monograph. As this monograph may not be in all of your libraries, I will take the liberty of describing the technique which I follow and which I have seen Mr. Lane use in his clinics both at Guy's, and the Children's hospital in London.

The necessity of this repetition of Lane's technique is emphasized by the misunderstanding that evidently exists. In the *Medical Record* of April 12th a surgeon of national reputation describes a faulty short-circuit operation, and invites the unwary to error by enlarging upon the ease with which it may be done. He says, "The ileum or cecum is placed against some convenient segment of the sigmoid colon and the two structures held temporarily by traction sutures are quickly united in such a way that four or five feet of the offending colon are thrown out of commission. Such a method while enticingly easy must surely be followed by a considerable percentage of cases of fecal regurgitation and impaction. Recently in our town a surgeon removed a colon filled with impacted feces. Some months previously a short-circuit operation had been done at a well known clinic. At a meeting of a medical society when the short-circuit operation was under discussion an internal medicine colleague protested against it. He had returned from a prolonged sojourn in Vienna where he had seen the enormously distended colon removed in two cases after short-circuit operations. Later on, talking with him, I found that the cecum had been anastomosed with the sigmoid which the author above quoted would lead us to believe was a proper thing to do. To insure success, Lane's technique should be followed without any variation.

In preparation for the operation it is of the

greatest importance to thoroughly clear the colon from fecal contents. This preparation should be begun at least two days before the time of the operation and two or three large doses of castor oil should be given during this time. It is of the highest importance that the tissues be well loaded with water before the time of the operation, the reason for this being that in event of post-operative vomiting the patient will be deprived of water as, owing to the displacement of the colon from the fecal circulation and the low position of the sutures in the anastomosis the post-operative administration of water by the colon is not advisable. So necessary is this that during the progress of the operation subperitoneal injections of physiological saline solution are given. The needles are connected by a Y tube with a reservoir containing two quarts of deci-normal salt solution and as the operation proceeds the entire quantity allowed to run under the breasts.

The operation is done with the patient in a horizontal position. The incision extends from the pubes to the umbilicus. The peritoneum is fastened to the towels by suitable clamps. The clamps are covered with moist towels, and the intestines are brought out of the pelvis and laid above the incision on these towels and then covered either with warm moist towels, or as Lane does, with a piece of thin white silk soaked in liquid paraffin. This is transparent, shows the intestines well, and of course completely protects them. After a general examination of the abdominal contents the cecum and ileum are brought out of the wound. The rectum is then located by passing the hand into the pelvis and following it upward making sufficient traction to bring the lowest accessible point just above the promontory of the sacrum. It is then clamped with an ordinary curved stomach clamp covered with rubber. A sufficient portion is brought through the clamp to make a ready anastomosis with the severed ileum. A moderately heavy silk or linen suture is passed bit by bit under the peritoneum like a purse string, crossing from the right to the left side to close the opening on the posterior peritoneal surface, which would exist when the ileum is anastomosed to the upper part of the

rectum. The mesentery here contains many large vessels, the wounding of which with the needle might be serious. This suture must therefore be introduced with great care. It is not tied at once, but is clamped with artery forceps and laid aside. The ileum is clamped about 2 inches from the ileocecal valve. A thin catgut ligature is tied into the groove left by the clamp. A straight, soft intestinal clamp is then fastened upon the ileum about an inch above this, and suitable ligatures placed in the mesentery. The ileum is then cut off flush with a forceps, and again just above the ligature these ends being carefully held away from the sponges and tissues. The stump is immediately cauterized with a Paquelin cautery which is also drawn across the cut edge of the upper part of the ileum which is held by the forceps. The lower part of the ileum is then inverted with a suitable silk or linen purse string to make it doubly secure. The ileum is now brought to the upper part of the rectum, and a half turn upward taken with the forceps that clamp the ileum, thus bringing the outer part just above the clamp against the side of the rectum. This is stitched on with continuous suture of fine silk or linen, as in the first line of suture in a gastro-enterostomy when it is done by continuous suture. When this line of suture is completed a vertical incision parallel to it is made in the rectal wall, the parts being then surrounded by additional sponges and the upper clamp is removed. If the ileum does not seem to be entirely empty it will be well at this time to place a soft intestinal clamp, covered with rubber several inches above the end to prevent the contents of the ileum from coming down over the wound. The second line of suture is now placed immediately above the first line, and then the other side of the anastomosis is completed just as the upper line of suture would be in gastro-enterostomy. After the completion of this line of suture the towels immediately surrounding the field of operation are removed and the operator either changes his gloves or thoroughly cleanses the ones he is wearing. The retroperitoneal purse string is now tied. This may be done by the assistant, while the operator passing his hand just above the anastomosis,

makes sure that no loop of the ileum is within the grasp of the suture and also in observing its gradually tightening effect controls the tension placed on it by the assistant. After this is tied a second assistant passes a soft rectal tube about 16 inches in length into the rectum. The operator guides this through the new anastomosis into the lower part of the ileum. The assistant then fastens the tube with a silk worm suture which is passed first through the skin of the perineum and then through the wall of the tube. This tube is allowed to remain in position for about six days. It serves for permitting the ready escape of the contents of the ileum whether fluid or gas, and is an important factor in preventing the possible post-operative abdominal distention. In practice I find that this maneuver is not as easy as it would seem and I find it decidedly advantageous to cut rather deep notches into a side of the rectal tube so that they can be readily felt by the operator and be used to assist in drawing the tube upward. One of these notches is placed about half an inch from the end and the other about $3\frac{1}{2}$ inches further down the tube. They should be deep enough to be readily felt through the intestinal wall and furnish some purchase for drawing it upward. When the tube is first introduced it is inclined to curl upon itself in the rectum and illustrates to me very well the fallacy of the so-called high enemas. I am convinced that in giving them the tube almost never enters the sigmoid but curls upon itself in the rectum. By passing his hand into the pelvis the operator can feel through the rectal wall when the tube comes into the bowel and guide it upward into the opening. The notches are of great assistance in this, and also when it passes into the ileum. The ileum should be drawn down upon the tube at least a foot, so that the end is well placed in the small bowel. This completes the operation, and the abdominal wound may be closed in the usual manner.

Faecal regurgitation after this operation has occurred in a few cases fortunately however not in my own practice. It was the fear of this occurrence that caused me to recommend appendicostomy as a routine safety measure in Lane's operation. This I did in a paper

published in the *Annals of Surgery* in April, 1911. At that time Lane's operation was popularly considered to be an ileosigmoidostomy. If ileosigmoidostomy is done faecal regurgitation will frequently occur for the reason that an important factor in the production of the taxis is the last fold in the sigmoid. The anastomosis must be done below the sigmoid at the upper part of the rectum. Faecal regurgitation then must be exceedingly rare. I know that it does occur occasionally for I saw Lane remove a colon which he had short-circuited nine months before in which there was a faecal mass in the caecum. In about forty short-circuit operations which I have done I have not had so far a single case of faecal regurgitation. For this reason I have abandoned appendicostomy. I still have under observation several of the cases I operated on while I was doing this. Only one of them however makes any use of the appendicostomy opening. About once in six weeks or two months she flushes out her colon.

By following with care Lane's technique in fastening the peritoneum to the towels, and in cleansing or changing gloves after the anastomosis has been made I have not had suppuration or any secondary infection in a single one of the cases on which I have operated. The post-operative convalescence is many times symptomless. The final results of the operation are so good that I am convinced that in time it will be generally accepted as a means of permanent cure of intestinal stasis. The measure seems so radical that many of the profession hesitate to accept it, or turn it aside with indifference or even violently oppose it as an unreasonable and dangerous measure. To avoid making this a just censure, the operation should be undertaken only when hygienic and medicinal measures have failed to cure and then only by surgeons well skilled in intestinal surgery following implicitly the details which Lane regards essential. The operation is by no means as easy as a gastro-enterostomy. The indifference and even opposition with which this measure has been received is, I am satisfied, due to a lack of understanding of what it is and what it will accomplish. Time will surely give the operation its proper position.

THE OPERATIVE TREATMENT OF ACUTE GONORRHOEAL EPIDIDYMITIS

BY JOHN H. CUNNINGHAM JR., M. D. BOSTON

SINCE Dr F. R. Hagner first published the technique and results of his method of operation for acute gonorrhoeal epididymitis in 1906 his method has been employed by many surgeons. The experience of others as well as that of Dr Hagner has been reported from time to time in medical literature. A study of these reports shows that there exists a uniform opinion in regard to the results of this method of treatment, which is that this procedure when applied to cases of severe acute gonorrhoeal epididymitis is followed by immediate relief of pain, a drop in temperature and of leucocytosis and that the convalescence is materially shorter than it is by the expectant form of treatment. In no report is there mention of any recurrence of the disease in the organ operated upon. In a large proportion of the cases the absence of a recurring active discharge after the operation has been significant and in some no recurrence of the urethral discharge has appeared. Whether or not this operative procedure lessens the percentage of sterility in the individuals who have the disease in bilateral form has not as yet been determined.

It is with the desire to add my experience in support of this form of treatment of this malady and to speak of the pathology and of the subject of sterility following this method of treatment in bilateral cases that this communication is presented.

Acute gonorrhoeal epididymitis cannot be considered as being other than an acute inflammation of this appendage. The operative interference in this malady is the simple application of the principle of drainage to an acutely infected organ. It appears that Pirogoff recognized this fact and punctured an acutely inflamed epididymis as far back as 1852 and H. Smith in a publication in 1864 mentions a series of 1,000 cases in which he punctured the acutely inflamed epididymis

with beneficial results. It appears that the value of drainage in this disease was lost sight of until Hagner published his technique in 1906.

As is well known acute gonorrhoeal epididymitis is very common. It is variously estimated to occur as a complication of gonorrhoea in twenty to thirty per cent of the cases. Gonorrhoeal epididymitis results from an extension of a posterior urethritis along the ejaculatory ducts and vas deferens. Infection of the prostatic glandular tissue (prostatitis) usually is present before this extension takes place. Occasionally the prostate may escape the infection the inflammation extending almost immediately to the epididymis from the deep urethra. Inflammation of the ampulla, the vas and the seminal vesicle generally takes place. The inflammatory process continues along the mucous membrane of the vas to the tail of the epididymis where the extension of the disease is usually arrested, probably because of the convoluted character and minuteness of the canal. In the severer forms of the malady the body and head of the epididymis are also invaded. Epididymitis is usually unilateral. Double simultaneous epididymitis is extremely rare. Subsidence of the process within one organ and its subsequent appearance in the organ of the opposite side in the course of a few days is not unusual. Why the inflammation extends along one duct and not the other at the same time when these two ducts open at a distance from each other of but a few millimeters is not clear. The extension on one side only may be due to the occlusion of one opening by swollen mucous membrane while the other remaining patent allows the infectious product to gain entrance.

Since 1906 the writer has employed this method of treatment in most of the cases of acute gonorrhoeal epididymitis that have been in his care and has not restricted the

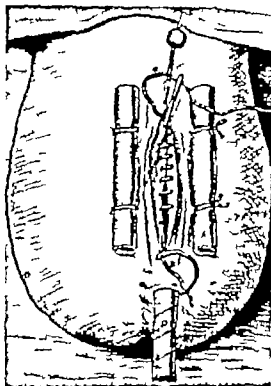


Fig. Method of closing the scrotal wound. A—A two rubber tubes over which are tied the silk catgut sutures passing through skin, dartos and tunica vaginalis. B—catgut suture closing the edges of the tunica vaginalis. C, subcutaneous silk-worm-gut suture closing the skin wound. D drainage tube placed along the outer side of the punctured epididymis.

treatment to the very severe forms of infection as Dr Hagner has done. In collecting the material for this paper fifty-seven cases from which reliable deductions may be drawn were used. Of many other cases upon which the operation was done so little is known that they are not mentioned except to say that the immediate relief of the symptoms is known to have taken place. Hagner's technique, with the exception of closing the wound has been followed in most of my cases.

From some of the patients pieces of the epididymis were resected for the purpose of pathological study which is one part of this communication. There were six patients upon whom a bilateral operation was done. From these observations have been made

with regard to the occurrence or the contrary of sterility.

Hagner's technique is as follows. The junction of the epididymis with the testicle is defined and an incision about two inches long is made through the scrotal skin along this line. The tunica vaginalis is opened and such fluid as may be present in its cavity escapes. The swollen epididymis with the testicle is delivered. The epididymis is now punctured in many places with a narrow bladed knife in the inflamed area. The punctures must penetrate the infiltrated fibrous covering and the body of the epididymis must be entered by the point of the knife. If pus escapes from the punctures the opening through which it makes its exit is to be enlarged and the cavity from which it comes is washed out with a corrosive sublimate solution of 1:1000 strength by means of a syringe.

If the punctures do not yield pus after the puncture has been made through the fibrous covering they should be probed with a small probe or director. In this way at times foci can be opened which may have escaped puncture with the knife. The epididymis should be squeezed and its surface and that of the testicle and tunica vaginalis sponged with a corrosive sublimate solution of a strength of 1:1000 followed by a sterile saline solution. The testicle is then replaced. A puncture is made at the bottom of the scrotum through which a rubber dam drain is placed in such a way that it lies along the outer side of the whole length of the epididymis. The skin wound is then closed by passing two silk-worm-gut stay sutures through the skin, dartos and tunica vaginalis and tied over rubber tubes one on either side of the wound. The tunica vaginalis incision is closed by continuous fine catgut suture and the skin incision by a subcutaneous silk-worm-gut suture (Fig. 1). A sterile dressing and a supporter are applied. The stay sutures are to be removed at the end of the first twenty-four hours, their purpose having been to prevent the dartos from retracting and thus causing ecchymosis in the lax scrotal tissue. The drainage dam is removed on the second day. Most cases are up on the third or fourth day. The silk-worm-gut skin suture is usually

removed on the eighth day. In many of the cases the catgut knot works out which delays perfect healing. If the two silkworm gut stay sutures prevent all bleeding from the dartos, as they usually do, the catgut suture of the tunica vaginalis may be omitted.

The writer's experience in the performance of this operation has shown that in all but five cases there was fluid in varying amounts in the tunica vaginalis. In those in which this fluid was examined for the gonococcus none were found nor were any other organisms present.

In the five cases in which there was no fluid there was an agglutination between the visceral and parietal layers of the tunica vaginalis brought about by an inflammatory exudate which bound the epididymis to the parietal layer. In all of these cases the disease was of more than three day duration, and in all but one it was of five day or more.

In 67 per cent of the cases gross pus in varying amounts was demonstrated and in each instance when it was not present but the material obtained by the punctures was examined microscopically, pus was always found. The latter class included all the cases of short duration.

From this fact it is believed that if these cases were left without operation they would have gone on to resolution or to the pathological condition seen in those of longer duration.

The organisms found in the pus from the punctures of the epididymis have always been the gonococci. When the gross pus was examined this organism has usually been found. In the earlier cases before gross pus was present, the gonococcus was often but less frequently found.

The testicle has never been observed to be involved except by the extension of the epididymal congestion over its surface.

In regard to the post-operative observations, the absence of pain on recovering from the anæsthetic has been the greatest recommendation for the operation, the fall of temperature and of the leucocytosis and the rapid disappearance of all evidence of toxæmia has been the same as in other cases reported.

The convalescence has been materially shortened as compared with that seen in connection with the expectant treatment.

The urethral discharge has recurred in all but four of the cases, but it is a noteworthy fact that the recurrent discharge was seldom as severe as when the disease is treated by palliative measures. In the vast majority of the cases the subsequent treatment of the prostate and the seminal vesicles was not so prolonged as it is in the average case of the disease in these structures without the concomitant development of acute epididymitis. This feature is not easy to understand. It is, I believe, important to treat the prostate and the vesicles whether the discharge is little or great following the subsidence of the process in the epididymis for these structures are usually involved in the cases in which the infection passes to the epididymis.

Brønnum has found the gonococcus in the secretion of the seminal vesicle on the same side as the inflamed epididymis in 80 per cent of the cases and in the other 20 per cent leucocytes without the organism.

As a rule I have begun the treatment of these structures by massage and deep urethral injections about two weeks after operation.

Two patients who developed the disease in the organ of the opposite side did not return after the operation for treatment of the infection remaining in the genital tract because the symptoms immediately following the operation were so slight.

In four cases I combined the Belfield procedure of opening the vas together with the epididymotomy. These cases did not show results differing from those in which this operation was not done.

In regard to the duration and occurrence of induration remaining in the epididymis after operation I have seldom seen it disappear in less than two months but the cases observed several months after the operation do not present the discreet indurated sclerotic areas in the globus major or minor which are discovered as a sequelæ of epididymitis in which the operation is not done.

In no instance of which I have had knowledge has there been a recurrence of the disease in the epididymis operated upon.

In my series I have operated bilaterally in six cases. Two of the patients had no further treatment after the first epididymotomy and

developed the disease on the opposite side. Two owe their infection on the opposite side to a newly acquired infection after the previous infection had disappeared, and two developed the disease while under treatment. The two patients acquiring the new infection developed the disease in the epididymis not at first affected and operated upon.

Fortunately I have been able to make observations in regard to the presence of spermatozoa in all of these cases. One of this group was married five years ago and has two children. Another has been married over four years and has two children.

The seminal fluid from two others has been examined it being collected in a condom during sexual intercourse. Both patients showed numerous living spermatozoa. Two others have had no intercourse and the fluids obtained by massage of the vesicles showed no spermatozoa. One of these patients was operated upon the second time four years ago the last examination of the massage fluid being two months after the last operation at which time he still had a slight discharge. I have been unable to locate this patient for examination at this time. The other patient showing no spermatozoa in the massage fluid is still under treatment for disease within the prostate and vesicles. It is of interest to note that the massage fluid from the two patients who showed living spermatozoa in the seminal fluid collected in the condom showed no spermatozoa in the massage fluid, though spermatozoa were numerous in the fluid that was collected during the sexual act.

In regard to the pathology of the condition it is well known that the process is most active in one part of the epididymis, most often in the tail or globus minor and next most frequently in the head or globus major.

It has been observed clinically that the inflammatory exudate resolves without clinical evidence of abscess formation. It has also been observed that a secondary hydrocele dependent upon the inflammation in the epididymis occurs in most of the cases. In the reparative process, connective tissue changes take place resulting in hard nodules at the site of the acute process. These changes are usually permanent and may occlude the seminiferous

tubules or canals of the epididymis, so that the spermatozoa cannot escape or are impaired in vitality in so doing. When both epididymies are involved, sterility may result. Buxa in this connection states that an investigation of the soldiers of the German army showed that 41.7 per cent of those who had bilateral epididymitis were childless. Liegeois (Kocher) found in twenty-eight that after bilateral epididymitis spermatozoa were absent from the seminal fluid in twenty-one.

For the purpose of histological study pieces of the inflamed areas have been removed in some of my cases. These specimens were studied by Dr F W Mallory director of the pathological department of the Boston City Hospital. The pathological histology varies with the duration of the disease. In the early phases—within three days—the ducts are distended and filled with polymorphonuclear leucocytes.

Among them are also phagocytic endothelial leucocytes. In places the lining epithelium is destroyed and the exudation is directly continuous with an extensive infiltration of connective tissue with similar leucocytes. In places the tissue has been destroyed and dissolved so that small abscesses exist. At the periphery of the acute process there is some infiltration with lymphocytes and some proliferation of fibroblasts. In some of the polymorphonuclear leucocytes are flattened diplococci shown to be Gram negative.

In a later stage of the disease there is shown a fewer number of polymorphonuclear leucocytes in the lumina of the ducts. The intertubular connective tissue is much increased in amount and is infiltrated in places with lymphocytes. In a few of the leucocytes, even in the instances in which the tissue has been taken as late as ten days after the onset, Gram negative diplococci have been found.

I believe that epididymotomy offers the best means of ending an acute gonorrheal epididymitis and allaying the symptoms dependent upon this pathological condition. The small series of cases operated upon in which the disease was bilateral show a relatively high percentage not becoming sterile which is an important factor in support of this form of treatment.

DEPARTMENT OF TECHNIQUE

THE PROTECTIVE MASTOID OPERATION AN OPERATION OF FLECTION¹

By W. SOHMER BRYANT A. M. M. D. New York City

THE point of view concerning the function of the mastoid operation has undergone a striking change. Formerly the entire idea of this operation was stern necessity — the last resort for the saving of life. In its present state of perfected technique the mastoid operation usually accomplishes this function. Now technical skill and common sense have perceived in it a wider scope, a range of usefulness adapted to the supreme help of the ear.

The improvement in accuracy of diagnosis, certainty of prognosis and results of technique justifies an extension of the field of usefulness of the mastoid operation. Formerly the mastoid operation has been usually an emergency operation, the protective operation is an operation performed at the time of election. The protective mastoid operation is a supplement to nature in her work of economy and conservation.

The protective mastoid operation should not be performed without profound technical deliberation. It is an axiom that we do not operate in every case of middle ear suppuration, for many cases of purulent middle ear inflammation convalesce satisfactorily without an operation. This is especially true in chronic middle ear suppuration, where many cases will heal with little difficulty and with very satisfactory results by appropriately applied milder treatment. As a general rule the cases that indicate a protective operation are those whose pathological condition is so far advanced that it seems unavailing to attempt milder treatment and also the cases which do not respond to mild treatment within a reasonable time.

The protective mastoid operation is definitely indicated in the following:

(1) All cases which have some residual hearing in the presence of middle ear suppuration resistant to mild treatment. The hearing will become progressively worse as long as the destructive process continues, because of the extension of ulceration and increased middle ear electrization.

(2) Cases of middle ear suppuration (with or without mastoid complications) which may be the source of chronic toxic absorption. The protective operation, by checking the suppuration of the ear, destroys this nidus of infection.

(3) Cases of middle ear suppuration (with or without mastoid complications) which may be the focus of infection causing serious complications such as brain abscess, sinus thrombosis or meningitis.

An appreciable interval between the inception of the middle ear suppuration and the performance of the protective mastoid operation should be allowed in order to justify our conclusion that in the case under consideration the suppuration will not stop without a protective operation or in time to save the hearing, and also that the danger of serious complication is imminent. Proper diagnostic skill and due weighing of accurately ascertained diagnostic indications negate the chance of error in the election of this protective operation.

The ideal protection of the ear calls for the mastoid operation as follows:

1. The mastoid operation for the cure of chronic middle ear suppuration.

2. The mastoid operation for the cure of acute or subacute middle ear suppuration with or without mastoid involvement.

3. The mastoid operation to relieve the patient from a long and dangerous expectant period while waiting for resolution or for development into a mastoid abscess sufficiently urgent to require an emergency operation.

The special technique to be employed varies with the stage of the suppuration, its extent and the topography of the region involved.

First group. In cases of chronic middle ear suppuration, the various forms of radical mastoid operations are protective operations because

They destroy the focus of infection of the discharging ear which supplies pyogenic organisms disseminated by means of linen, dust, hand

shaking and various other ways. A source of infection is thus destroyed which might have become a source of general infection and which might have given rise to every grade of pyogenic infection, to the most virulent.

They destroy the source of bacterial poisons, which are often the source of chronic toxic absorption, as is seen in cases with chronic middle ear suppuration. The protective mastoid operation interrupts this morbid cycle giving the individual a chance to recover normal health after the suppuration of the ear has been corrected by the protective operation.

They arrest chronic middle ear suppuration and prevent terminal complications, such as brain abscess, sinus thrombosis, meningitis, broncho-pneumonia, bacteremia, nephritis, pericarditis, endocarditis and erysipelas.

Technique. Various techniques have been devised for the mastoid operation for the radical cure of middle ear suppuration. They are all founded on a common principle, namely, the obliteration of the mastoid antrum. Different techniques have been advocated by Schwartz, Stacke, Heath, Bondy, Mahu, Streit, Loc, Barany, Citelli and others.

I prefer the techniques that destroy the least tissue and of them I prefer the technique that I have adopted in either the conservative radical operation or the modified radical operation.

The conservative radical mastoid operation is indicated when the middle ear structures are of no further auditory value or are destroyed. In my conservative radical mastoid operation the middle ear is not curetted and no tissue is removed from it. The antrum is opened widely into the auditory canal, the outer anterior wall of the attic is removed with its contents, the Eustachian tube is preferably kept open, and the restoration of a cicatricial drum membrane is not hindered in any way.

The results in this conservative radical mastoid operation are an arrest of suppuration, a stable middle ear cicatricial condition, no painful dressings, a shortened convalescence, no disfigurement and taking into consideration the loss of the middle ear mechanism maximum of hearing. In this operation, the hearing is improved beyond what it was before the operation.

The modified radical mastoid operation is adapted to the radical cure of chronic middle ear suppuration when the middle ear sound transmitting mechanism is still capable of some functional activity.

The operative field is attacked as in the conservative radical but the attic is not obliterated. It

is opened only as far as the preservation of the ossicles in position will allow.

The results in my modified operation are, in many respects, similar to those obtained in the conservative radical mastoid operation. In this modified operation however it is possible to obtain a shorter convalescence and, since the election of this operation presupposes some residual functional activity of the middle ear mechanism, it is possible to obtain a higher degree of hearing, often above normal. In this operation, also, the hearing is improved beyond what it was before the operation.

Second group. The mastoid operation is indicated as a protection in many cases of acute or subacute middle ear suppuration with or without mastoid complications, when the indications point to eventuation into a chronic middle ear suppuration which, for its final cure will require a radical mastoid operation.

Under these circumstances the indications for the operation are based on the Röntgen-Ray findings. All acute cases of middle ear suppuration should be skidagrammed. Where the skidagram shows a mastoid bone without air cells surrounding the antrum, we are reasonably certain that in these cases the suppuration of the middle ear will not readily yield to treatment. Furthermore, we are practically sure that the acute suppuration will eventuate into chronic suppuration. If indeed, it is not brought to an abrupt termination by the development of the fatal complication of mastoiditis. After the inception of middle ear suppuration in dense mastoids, an interval of from 4 to 8 days should intervene before doing my modified radical mastoid operation. Cheate's anatomical observations form the basis of the indications.

The technique of the operation for the cure of acute suppuration of the middle ear with the solid mastoid bone is the same as the technique of my modified radical operation.

The results of my modified radical operation in acute cases of middle ear suppuration in solid mastoid bones re-arrest of suppuration, stable middle ear condition, no painful dressings and moderately short convalescence. Also the results are better for the hearing and in proportion to the previous group more cases are restored to normal or above. In many cases the hearing is improved even beyond what it was before the suppuration of the middle ear.

Third group. In acute or subacute infections of the middle ear the protective mastoid operation is indicated to relieve the patient from a dangerous expectant period while waiting for a

mastoid abscess to develop or the suppuration to resolve. This group is limited to the cases in which the skiagram reveals pneumatic cells communicating with the antrum. The most important indication for the operation is unsatisfactory drainage, even after myringotomy and douching.

A protective mastoid operation is advisable in order to cut short the process because of the danger to the patient from capital complication of middle ear infection which may arise at any time without warning. The protective mastoid operation is also indicated on account of the impairment to hearing caused by the middle ear suppuration. The longer the continuation of the ulcerative process, inevitably associated with this suppuration, the greater the loss of the essential parts of the sound transmitting mechanism of the middle ear. The longer a suppuration lasts and the greater the destruction of tissue the more abundant will be the final cicatrices, which hamper the physiological sound transmission of the middle ear.

After the inception of middle ear suppuration in cellular mastoids, an interval of from 1 to 4 days should intervene before doing my simple mastoid operation.

The technique of my simple mastoid operation demands the removal of the mastoid process, the opening of all cells, the removal of all affected bone, the removal of the available posterior osseous mental wall between the annulus tympanicus and the facial ridge, the leveling of the edges of the bone wound and the longitudinal section of the membranous canal along the

posterior inferior wall, the closure of the posterior wound with the insertion of a minimum drain followed by its early removal that is to say my modified blood clot dressing.

The results in my simple mastoid operation are the same as those in the previous group except that the minimum time of convalescence is reduced to as low as three days and that the hearing is more frequently restored to normal or above and in still more cases is improved beyond what it was before the suppuration of the middle ear.

The object of these three elective operations — conservative radical modified radical or simple mastoid — is

From a pathological standpoint — to stop the suppuration.

From a protective standpoint — to forestall complications.

From a functional standpoint — to preserve or improve the hearing.

The supreme test of the technique in a specialty of any definite organ is the conservation of the function of that organ. Our specialty is too often criticized as accomplishing too little in the preservation of the hearing. The mastoid operation offers, when used according to the indications, the most effective method for the reasonable amelioration of the consequences of persistent suppuration. Thus, in addition to the important function of stopping the suppuration, the elected operation, by providing the maximum protection to the parts of the hearing mechanism preserves the hearing which is in jeopardy.

POSTURAL TREATMENT OF POST-OPERATIVE ABDOMINAL ADHESIONS

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ONE of the most troublesome conditions the surgeon is called upon to treat is recurrent and persistent post-operative abdominal adhesions. The unfortunate victim of these adhesions may be completely disabled by the constant pain and the surgeon may find that even after repeated operations no permanent relief can be obtained. Of course, the majority of these cases may be expected to recover satisfactorily after the usual operative measures for the relief of these adhesions, but there is a small percentage of

cases which seem to resist all treatment and to get worse after each of several operations. It is these more serious cases I wish to consider briefly and to suggest a procedure I have used successfully which may serve to relieve some of these patients. It will be noted that I say *relieve* the symptoms and not necessarily to *cure* or *prevent* these adhesions, for I think it is useless to hope for an anatomical cure in some of the worst of these cases.

The whole subject is full of puzzling contradic-

tions in the first place we cannot explain why these adhesions sometimes result after the most trifling surgical interference, while in other cases they do not follow even prolonged exposure or forcible manipulation of the abdominal contents and again, the relation between the adhesions and the resulting symptoms are contradictory, extensive adhesions often are not accompanied by discomfort and *vice versa*, severe symptoms are often produced by very slight adhesions, though no doubt the recent findings of the marked differences in sensibility of various parts of the peritoneum will explain this apparent variability of cause and effect.

It is, of course, of first importance to prevent these post-operative adhesions so far as can be done by a careful technique for they may not only cause great discomfort to the patient and thus mar the otherwise good results of a successful surgical procedure, but these adhesions are the chief cause of acute intestinal obstruction. Much may be done by consuming as little time as possible in operating, for mere exposure of the open abdomen to the air is known to be harmful by inflicting as little trauma as possible by avoiding unnecessary manipulation, violent sponging and wound retraction by careful hemostasis, as blood-clots in process of absorption will cause dense adhesions by using only moist sponges and pads as dry gauze is particularly irritating by the use of drainage only when absolutely necessary and then by using rubber drainage tubes or gauze protected by rubber tissue and never unprotected gauze packing by covering raw surfaces and pedicle stumps as completely as possible with peritoneum or omentum by protecting the intestines from irritating fluids or antiseptics and especially to prevent coils of intestine from lying on the unprotected field of operation which has been prepared with iodine, and this is probably of present importance because of the almost universal use of this irritant antiseptic for skin disinfection.

These points of surgical procedure are axiomatic and their value need not be elaborated here however the most careful surgeon cannot always avoid the exposure of long operations much manipulation is often necessary drainage must often be used the peritoneum even in so-called

clean cases must always react somewhat to take care of at least a slight infection, for of course absolute asepsis is never attained in any surgical work. Even aside from the influence of these known factors, it seems likely that certain individuals have a marked tendency to peritoneal hyperplasia, just as other individuals may have

an unexplained tendency to keloid growths on the skin.

There have been many methods proposed for the prevention and cure of these adhesions, some of which will be mentioned briefly. All methods recognize the uselessness of merely breaking up these adhesions and endeavor by some means to keep apart the raw surfaces until such surfaces can be covered with newly-developed peritoneum. Various substances have been used to accomplish this purpose such as sterilized air nitrogen or oxygen gases, the introduction of large quantities of salt solution just prior to wound closure was a routine procedure a few years ago, but the solution is too quickly absorbed to be effective. Sterile olive oil has been used, but the results have not been very satisfactory some patients reacting rather severely to its presence in the abdomen. Cargile membrane, the dried sterile peritoneum of the ox, has been extensively used to cover the abraded areas of peritoneum, but positive evidence of its value is lacking, and after all this membrane can only be regarded as a foreign body whose successful application to large surfaces is difficult, for a little blood or serum will easily float it away from its proper position. Paraffin lanolin, gelatine, gum arabic and similar substances have been used the mere length of the list, like the remedies for whooping-cough, suggests that the value of any is doubtful.

Many reports from the literature could be quoted to show that these adhesions are serious surgical complications and that their treatment is often disappointing. Murphy reports a case in which 14 laparotomies were done for adhesions following appendectomy with final good result. Griesenhagen reports a case having no operations before even moderate relief was obtained. Three years ago Dr. Starry read an article on this subject before the Washington Medical Society in which after reviewing the causes and treatment of these post-operative adhesions he reported a case operated on seven times, including one intestinal resection, with only partial relief. Numerous similar reports indicate the frequency of the complication and the difficulty in effecting cure.

I wish to report somewhat in detail a case which illustrates the great amount of suffering and disability which a victim of recurrent and persistent adhesions may be forced to endure. The clinical history is similar to numerous cases which have been reported and is only of possible interest because of the fact that complete relief was finally obtained by a means of treatment which so far as I know is somewhat original.

E. P. age 26, single German servant girl of phlegmatic temperament, had the usual children diseases and also typhoid when about 3 years old menstruation began at 7 and for several years was somewhat scanty and painful, but she was fairly healthy until in 1906, at the age of 20 she was operated on in Cleveland hospital for appendicitis. This operation was the beginning of series of surgical experiences which lasted almost continuously for three years. She could give no information as to this first illness, except that the attack was acute and that the appendix was removed, the wound apparently healing without drainage. Within few months she began to have severe, dragging pains in the lower abdomen and she was soon obliged to give up work, as the discomfort was especially great when she was on her feet. She was admitted to the gynecological service at the Garfield Hospital in January 1907 complaining of this abdominal pain, which was especially severe at the menstrual period. A diagnosis of endometritis was made and the uterus was dilated and curetted. She left the hospital in about two weeks, but was readmitted in May 1907 about 5 months later complaining of constant pain in the right side and feeling of jumping sensation in the lower abdomen, mild she could talk but little because of the pain was easily tired and unable to work. Urination was painful, though analysis was normal. She was examined under ether but nothing definite ascertained. She left the hospital May 30, unimproved, with diagnosis of neurasthenia. She was readmitted 4 days later after having tried to work one day. For two or three weeks she suffered the usual pain and tenderness and had some irregular fever and occasional chills and slight leucocytoemia. All laboratory tests were negative and Dr. Clayton referred her to my service for the relief of probable peritoneal adhesions resulting from the operation for appendicitis 19 years before. At the operation extensive adhesions were found about the cecum and also about the sigmoid, nothing else abnormal was found, and the pelvic contents were normal. The adhesions were broken up or dissected out and raw surfaces covered with catgut membrane or turned in with catgut stitches. She was discharged August 1, feeling very well. This improvement lasted only a couple of months and in December 1907 she went to the Columbus Hospital where she was again dilated and curetted, and discharged in two weeks.

In April, 1908, she was again admitted to the Garfield Hospital where she was treated for the nervous and hysterical condition which had by this time become marked. After five weeks' treatment and rest she left the hospital considerably improved. However, a month later she presented herself again begging for an operation, which I reluctantly performed June 3, 1908. The condition found was worse than found at the previous operation as the intestine expressed it in his description. Adhesions were found all over the peritoneal cavity. Over two hours were spent in breaking up adhesions and freeing the large and small intestines. Ten or twelve sheets of catgut membrane were used to cover the raw surfaces and were stitched into place; the abdomen was filled with salt solution and the wound closed. She made rather tedious convalescence and left the hospital in two months feeling fairly comfortable. She tried to resume her work but the old familiar symptoms recurred in short time and during the next eight months she haunted my office begging for relief and asking for another operation. During this time various abdominal bandages and supports were used with only slight benefit. She was comfortable in bed, but the erect

position at once caused the dragging pain. I finally consented to operate a third time and opened her abdomen again on June 3, 1909. The adhesions were worse than at either of the previous operations with great difficulty most of the adhesions were broken up, special effort being made to free the parietal peritoneum. Large raw surfaces could not be closed and it was evident that adhesions would necessarily reform. It was determined, therefore, to make an effort to have them reform with the intestines as low down in the abdomen as possible, so that in the upright position there would be less tendency for the downward pull which seems to cause most of the acute pain in these cases. With this purpose the wound was carefully closed with tier sutures, reinforced with wide thorough and through stay sutures, and firm abdominal binder applied. Before final closure of the wound, the abdomen was filled with salt solution. As soon as she reacted from the anesthetic she was placed in sitting position and kept there. On the third day she was allowed to get out of bed and stand on her feet as much as her strength permitted. Within few days she was walking around the ward, but still rested and slept in partially upright position. She left the hospital in four weeks, she suffered no pain and improved rapidly, gaining 30 pounds in the next six months. She resumed her work and has continued well to the present time, a period of nearly four years.

From 1906 to 1909 this girl was in hospitals on ten occasions aggregating about 250 days, and underwent six operations. In spite of the fact she has remained comfortable for nearly four years, I am convinced she has as many adhesions as she ever had, but the present ones were formed when the abdominal contents were in their lowest position, so that there is now no pull on the parietal peritoneum when the patient is erect. From my experience with this case and from reports of many similar cases repeatedly operated upon, I think we must admit the impossibility of permanently removing these adhesions, but I believe many of these desperate cases can be greatly benefited by this postural treatment after the adhesions are broken up at operation. For this plan to be effective it is necessary first that all or nearly all adhesions be broken up especially on the sensitive parietal peritoneum so that the abdominal contents may adjust themselves at as low a level as possible immediately after the operation. Second that the raw surfaces must be kept apart for 1 or 18 hours by salt solution until the patient can be placed in the upright position, which must be done as soon as possible as it is known that raw peritoneal surfaces adhere very quickly.

The risk of such a procedure as this is not great and I believe it offers a good chance of relief to those recurrent cases not benefited by the ordinary operative measures.

THE FALCIFORM LIGAMENT OF THE LIVER AS PLASTIC MATERIAL AVAILABLE FOR USE IN THE UPPER ABDOMEN

By FORTNEY T. MILLER : M.D. FEB 15 1935

1. **Introduction**
 2. **Background**
 3. **Methodology**
 4. **Results**
 5. **Conclusion**
 6. **References**

WHEN d. along with an ulcerative or perforating lesion of the stomach or duodenum, one is not infrequently forced to decide upon some method to cover over a raw area with peritoneum, to reinforce a doubtful suture line or to seal a recent perforation which cannot be closed by a simple closure of it edges. In such circumstances the omentum usually lends itself readily to the purpose inasmuch as an abundance of es. by mobilized at once it fairly grants vitality to secure the omentum in its new position one may depend upon the power of its own or its supporting drains which perhaps in a few minutes but when de. long in the perforation one must attempt a more or less accurate suture whose introduction may easily be difficult because of a powerful ure and whose efficiency may well be doubtful. So radical an alteration in the position of the omentum however is not altogether a matter of indifference for the lower abdomen is heretofore also utterly deprived of its best natural defense against acute inflammatory processes many perforated pyelocysts are easily walked off in whole or in part by the omentum. In addition such a use of the omentum when made in a faulty technical manner may occasionally be the cause of a fatal intestinal obstruction. As a rule the best abdominal urgency is that which accomplishes its purpose with the least alteration of natural condition.

The foregoing consideration leads the writer to try the lacquered lining of the liver as plastic material.

[illegible]

The liver naturally supported itself protruding slightly from oral. The forward extremity of the liver was there; we divided between ligatures, broke up the peritoneal side of the vein, and the fold of the labium ligament. We did not think for this with the peritoneal portion of the liver flap almost entirely covered with peritoneum and it hanging from the oral side of the liver. The free portion of the broad based flap was now its own cover the ligature of its suture on the stomach wall. The liver was easily cut and had been possible, there was no more history upon the flap and it seemed to fit the purpose of all. The abdomen was closed. It did not seem of the patient real satisfaction. Consequently I was a case of operation the subject quite here from the past year and now complained of bad stomach, light weight, loss of appetite and marked indigestion of special kind. He has been perfectly cured.

[illegible]

The patient underwent peritoneal dialysis 24 hours after operation. No further peritonitis occurred but there was no evidence of any further protein leakage from the dialysis. The course of the rest was unremarkable.

Judging from the above experiences, the falciform ligament of the liver seems to be of some value plastic material available for use in connection with defect of the stomach and duodenum. It is possible that it may serve a similar purpose in connection with surgery of the gallbladder, biliary colic, ulcer, liver or transverse colon.

though no occasion for its use in this connection has presented itself to the writer as yet. The ligament offers a surprisingly large amount of tissue which is easily and quickly prepared, and whose vitality when prepared by the method outlined above is assured, since its blood supply is by a branch of the hepatic artery.¹

In suggesting this use of the falciform ligament it

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is fully realized that the field is a rather restricted one, but since, within limits, its use has proved of considerable value to the writer he feels it worthy of remark. No suggestion of the possibilities of the falciform ligament as plastic material has been encountered in the literature, though, be it said an exhaustive resumé has not been made. This brief presentation is made in order to call attention to the procedure and to recommend its trial when an appropriate occasion presents itself.

THE SELECTION OF THE ANÆSTHETIC UPON THE BASIS OF ITS ULTIMATE PHYSIOLOGY

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THE all-important factor in combating disease and repairing injury is the patient's vital resistance. By Nature, physiologic agencies, so far as we understand them, are directed toward cure and repair. It is a matter, then, of supreme importance that any artificial means added be of assistance, and not a handicap to Nature's supreme and all-pervading effort.

Preservation of life has been asserted to be the first law of Nature meaning thereby that it is a matter of instinct to guard the individual against physical injury. This doctrine however is true in a much broader significance, and the potentiality resides in every cell and organ, for all the individual's normal, physiologic agencies are, or may be, directed toward the preservation of life. The great task of the profession to-day, then, is to conserve, restore sometimes augment, but never unnecessarily impair, these physiologic activities. On the medical side it is generally conceded that the majority of patients recover without any assistance whatever. Our medical leaders, therefore, true to their conviction, gave little drug medication and were accused of leading the way to drug nihilism. On the other hand, serums, vaccines, antitoxins, etc. physiologic products, are ever widening their field of use in both medicine and surgery and seem to point the way to therapeutic progress and achievement. In other words, the era of physiologic medicine and surgery has already dawned.

In most surgical procedures it is necessary that a general anæsthetic be employed, and it is to the selection of this agent, in the light of this era, that your attention is here directed. Let us make the slogan of the day "Conserve the Patient"

Resistance." Accordingly the effects, other than the anæsthesia, of the different anæsthetics become an important matter. No longer can the anæsthetic be considered a success if only the surgeon be unperturbed throughout the operation and the patient survive the table a reasonable length of time. It is quite as important for the patient to retain his natural resistance after operation as it is for the surgeon to add artificial means for securing asepsis during operation. This is the new principle—turning the tide of battle only and leaving the patient with his physiology as nearly intact as possible. It seems to me that the object lesson of the results of conserving the patient's natural resistance has opened the vista of a new epoch in surgery." (1)

Most every surgeon uses one anæsthetic as a basis, and has it administered unless he believes it is contra-indicated. He may not use his favorite anæsthetic for even a majority of his operations, but nevertheless he uses it unless there is what he believes to be a good reason for using some other anæsthetic. Nitrous oxide is conceded to be the least toxic general anæsthetic in use and that it best conserves the patient's physiology. My plea is that it be made the basic anæsthetic, that is, that it be used unless, all things considered, it is deemed to be contra-indicated. Just what the contra-indications to nitrous oxide may be depends largely upon the attitude of the surgeon and the aptitude of the anæsthetist. I have administered it in point of time from a few seconds to over five hours to patients ranging from a few months to 90 years of age, to athletic and alcoholic subjects, to patients with arteriosclerosis and high blood pressure, and

with cardiac disease for practically every operation on the calendar and under all kinds of circumstances. In a large proportion of these cases all anesthetics might be said to have been contra-indicated that is, they were poor anesthetic and surgical risks, and for this reason nitrous oxide was selected. My greatest problem and fear has been with arteriosclerosis and high blood pressure. The authorities say that in these conditions nitrous oxide is contra-indicated, and they are undoubtedly correct but can not the same be said of other anesthetics? With what other anesthetic would a patient 85 years old, and having marked arteriosclerosis with cardiac involvement and high blood pressure pass through a three-hour operation (arteriovenous anastomosis, surgeon, Charles Goodman, Montefiore Home) without evidence of shock or other untoward symptom? Just recently I administered nitrous oxide to a woman, 71 years old, having marked arteriosclerosis and high blood pressure for pyometra and included a vaginal hysterectomy perineorrhaphy and Goffe's operation for a large cystocele (surgeon G. G. Ward, Jr. Post-Graduate Hospital) for an hour and fifty minutes with practically no shock, as evidenced by the patient's general condition, blood pressure observations, and prompt recovery without any anesthetic disturbance whatever.

Again, a patient over 80 years old passes through an operation that lasts an hour and includes a laparotomy (surgeon, Charles H. Peck, Roosevelt Hospital) with the best of results, both anesthesiologically and surgically considered. These cases are cited as illustrations only many more might be given. To hold that nitrous oxide should not be administered to the aged, as some do, is to deprive a large class of the benefit of the very anesthetic that I have found to be especially well adapted to their needs. It is true that these conditions require more care in administration, but that is technique not selection.

The critics say that nitrous oxide should not be administered in heart disease, but this view is not supported by the best authorities. Hewitt again says: It is now universally admitted that nitrous oxide is the safest general anesthetic known. (2) This is indeed a remarkable statement, coming, as it does, from a foremost authority. In most of the deaths reported under nitrous oxide the asphyxial element was not entirely eliminated—an absolute essential that admits of no modification whatever—or other factors were present, such as respiratory restriction, capnia, etc. which produce sudden fatalities under any anesthetic.

My own experience has been that nitrous oxide causes less cardiac disturbance than ether and that when nitrous oxide produces no cardiac disturbance ether may produce a marked cardiac depression, as the following will show: A patient, in a previous short operation, had marked cardiac depression under ether administered by one of our best anesthetists. A few weeks later in a two-hour abdominal operation (surgeon, S. G. Gant, Jamaica Hospital) nitrous oxide was used. The patient was quickly and easily brought under its influence, and the heart action was good. As there was some rigidity of the abdominal muscles a little ether was added to secure relaxation the effect was immediate cardiac depression. A few minutes later a small amount of ether in conjunction with the gas-oxygen was tried again, with the same result as before. At the end of the operation the patient was in good condition and made a very satisfactory recovery. Nitrous oxide, with this patient, was well tolerated. Another patient (surgeon, J. Van Doren Young, St. Elizabeth's Hospital) could not tolerate any ether whatever in conjunction with nitrous oxide, but did well on gas-oxygen only. This patient had suffered marked cardiac depression and toxic effect from a previous ether anesthesia. These illustrative cases might be multiplied multifold.

Furthermore I have not observed a single patient who tolerated ether as far as heart action was concerned, better than nitrous oxide providing there was no respiratory restriction. Acute cardiac dilatation, that has been mentioned in connection with nitrous oxide is due, I believe, either to an element of asphyxia, or to impairment of the respiratory movement, conditions that produce acute cardiac dilatation either under or indeed without any anesthetic whatever. Certainly a patient 85 years old, having marked arteriosclerosis, degeneration of the myocardium and high blood pressure could not, without ill effect, withstand for three hours a general anesthetic that had the slightest tendency *per se*, to produce acute cardiac dilatation. Cyanosis and respiratory restriction may be prevented. This is a very important phase of nitrous oxide administration, differing considerably in degree from that of ether.

Alcoholics constitute another class in which we are told that nitrous oxide is contra-indicated, but here again ether and chloroform are also contra-indicated. Alcoholism markedly lowers vital resistance, especially against infection ether and chloroform have similar action. Besides, in this class, both the liver and the kidneys are more or less involved, and thus distinctly contra-indicate

the more irritating and toxic anesthetics, especially in the very prolonged operations.

Eclampsia and parturition were formerly considered cardinal indications for the use of chloroform. Laboratory investigation, however shows that in eclampsia there is practically the same degeneration of the liver as that which often follows chloroform anesthesia, thus positively contra-indicating the use of chloroform in this condition. And in parturition in general who can say that eclampsia may not supervene or that the liver already overtaxed, may not succumb to the burden superadded by this agent whose toxicity is especially directed toward this organ? We have been recently advised to use ether but is this rational or scientific? The kidneys are also overtaxed mayhap already in the initial stages of inflammation. Administering ether is literally pouring oil upon smoldering coals. Besides, puerperal infection occurs occasionally. Why is nitrous oxide practically ignored in this connection? Is the profession so indissolubly wedded to its pest in the use of ether and chloroform that it is willing to risk sacrificing even the mother rather than heed this new lesson of science? Plainly the warning has been sounded. **Conserve the Patient's Resistance**

Infection of all kinds indicates the use of nitrous oxide, as both ether and chloroform, partially at least, through their action on the phagocytes, impair Nature's agencies for repelling bacterial invasion. This is a much broader indication than is at first apparent, for it not only includes active and latent infection prior to the operation, but also infection that may occur during, or for several days subsequent to, the operation, as this impairment of the patient's resistance lasts five or six days. The operations in which infection is prone to develop even though the technique is as perfect as usual such as in the operative treatment of fractures, use of metallic bone plates etc. clearly indicate the use of nitrous oxide. Finally what surgeon of experience has not, on operating found infection that was not previously diagnosed?

In addition to impairing resistance against infection, ether and chloroform detrimentally affect the red blood cells, and the volume of the blood as well, thus handicapping Nature's agencies for repairing injured tissues.

The beneficial action of nitrous oxide upon the general nervous system, as compared with that of ether and chloroform is very marked indeed.

The long-persisting train of symptoms of nervous exhaustion, neurasthenia, etc., is strikingly absent after capital operations under nitrous oxide. Crile shows that there is only one-fourth the injury to the brain cells under nitrous oxide anesthesia as that which occurs under ether with the same amount of trauma. (3) I have found that in many patients do particularly well under nitrous oxide.

Patients of low vitality or in shock, or where shock may be an important factor should be anesthetized with nitrous oxide. The reduction in amount of shock under nitrous oxide as compared with that under ether is very marked, both clinically and pathologically. In fact, patients developing shock under ether are often improved by substituting nitrous oxide, as shown by McKesson. (4) Patients in fright those particularly dreading the anesthetic or operation and those in great pain or who have just passed through a period of suffering do much better under nitrous oxide, as these conditions in themselves produce pronounced shock. In irritation or inflammation in the respiratory tract and lungs, diabetes, nephritis, pyelitis, cystitis, and in operation upon the kidney ureter bladder and prostate, the use of ether is contra-indicated on account of its irritant action. The comparative freedom from post-narcotic nausea, vomiting, depression and general discomfort alone under nitrous oxide renders it the anesthetic of choice in a large number of cases. Many patients refuse, or fatally postpone operative procedure on account of the unpleasant memory or the disparaging recital of a previous ether experience. Nitrous oxide, on the other hand, is known the world over as laughing gas solely on account of the pleasant impression it makes upon the patient's mind. And can you blame any patient for preferring to laugh rather than to vomit? After nitrous oxide administration consciousness is recovered very quickly even after prolonged operations, and the patient, frequently with a smile upon his lips that emphasizes the truth of his statement, often tells immediately of the pleasant entertainment he has had while the surgeon was operating upon his very vitals!

It has been urged against nitrous oxide that its administration requires skill, that it is expensive and that on account of apparatus and supplies required it is not adapted for use outside of institutions. Just a word as to each of these objections.

Does any one ever criticize an operation because perchance, for proper performance it requires skill? It is a stigma upon the whole pro-

At the meeting of the New York Surgical Society April 1901 several patients developing such infection were shown, and one case reported in which the infection developed early and as of such serious type that the patient soon died.

fession to object to anything that is of benefit to the patient, especially at a critical time, because its use requires skill. The necessary skill for administering nitrous oxide, just as that required for any other work, will be forthcoming just as soon as there is a real demand for it. This demand cannot be originated by the anesthetist; it must come from the surgeon.

The cost of nitrous oxide anesthesia depends almost entirely upon the method of administration. With the method that I employ and have elsewhere described I use an average of thirty-three gallons of nitrous oxide and twelve gallons of oxygen per hour, thus costing hospitals about sixty-five cents per hour of administration (5). This cannot be said to be expensive.

The apparatus that I use weighs 6½ pounds, and can be compactly folded and carried anywhere, together with sufficient supplies for an anesthesia of upwards of two and a half hours in an ordinary hand bag (6). Several other distinctly portable apparatuses have been described.

Let I be misunderstood however let me say emphatically that I do not advocate the use of nitrous oxide for all patients, conditions and operations, for no anesthetic fulfills that requirement. Besides, even though the selection of the anesthetic seems to have been properly made, the unknown individuality of the patient may upon administration, preclude its use, and a change be necessary. At the present time ether with the majority of surgeons, is the anesthetic of choice, and nitrous oxide is used chiefly as a means of last resort. My plea is that the last shall be first, not so much in point of use, but from the standpoint of consideration. Hewitt recently reiterated his former statement that nitrous oxide, when administered with a sufficient amount of oxygen to prevent all asphyxial symptoms, is practically free from danger to life (7). Most certainly it leaves the patient's physiology in the most perfect condition. Recovery depends entirely upon resistance. Why then, should not first consideration always be given the safe anesthetic that best conserves the patient's resistance? This does not require that it be used in the majority of operations, but that it always be used, if this can be done advantageously. It makes a vast difference whether it always be used

whenever reasonably advisable, or only as a last resort. The indications for its use ought to be balanced with its contra-indications. The contra-indications of nitrous oxide are relative, not absolute and if its indications equal or outweigh its contra-indications, it ought to be used. Either on the other hand, has absolute contra-indications such as in the more or less severe of the following: bronchitis, laryngitis, pneumonia, tuberculosis, infective appendicitis, peritonitis, nephritis, cystitis, sapremia, septicemia, bacteremia, pyemia, infective and some auto-toxemias, debility shock, etc. Relative contra-indications to ether become more absolute in very prolonged operations. That is, the longer the operation the more ether is contra-indicated, whereas with nitrous oxide the longer the operation the more it is indicated. Most of the contra-indications for nitrous oxide lie with the surgeon and the anesthetist rather than with the patient and the operation. Experience and comparative clinical observation of its beneficent action, therefore, broaden its field.

Life is not preserved and health is not restored by impairing normal, physiologic agencies. When life is preserved, or health is restored, with the patient's resistance unnecessarily impaired, it is at a risk, and with a responsibility that is not always justified. To handicap Nature needlessly with the anesthetic is sometimes to turn the tide of battle against the one we are striving to aid. Again I say: **Conserve the Patient's Resistance.**"

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3. CHASE, G. W. Newer Methods for Further Increasing the Safety of Surgical Operations, *J. Am. M. Ass.*, Dec. 9, 1911, p. 11.
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A MODIFICATION OF THE RECTUS FASCIAL FLAP IN INGUINAL HERNIOPLASTY

By GOODRICH B. RHODES A. B., M. D. CHICAGO, ILL.

Junior Surgeon to Cincinnati City Hospital, Good Samaritan Hospital and Episcopal Hospital for Children

IN a certain proportion of cases of inguinal hernia direct and indirect, the surgeon meets with a weakened, degenerated or lax conjoint tendon of the internal oblique and transversalis muscles, prohibiting its use as part of a reliable wall in hernioplasty. Especially is this true in long standing irreducible hernias.

To meet these conditions various plastic methods have been devised, employing muscular fascial or periosteal flaps from surrounding structures. The method herein suggested ap-

proaches the abdomen the cord is crowded into the upper angle of the inguinal canal as far as possible, forcing it closely against the fibers of the internal oblique and transversalis at their origin from Poupart's ligament. With the spine of the pubis as a center a distance is marked off on the rectus sheath equal to the distance from the spine to the cord at its entrance to the abdomen. This gives the level for the transverse section of the rectus sheath. The entire thickness of the rectus sheath is now converted into a triangular flap by

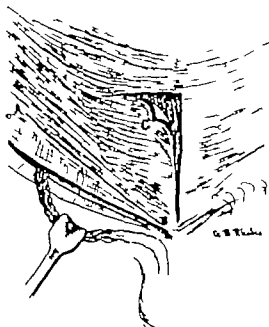


Fig. 1.

pears to result in a restoration to a condition very closely approximating that obtained by the Bassini operation. The writer has hitherto employed it in only one case an old, indirect hernia, with very gratifying result.

Approach to the operative field is made by a Ferguson incision with the convexity directed toward the midline of the abdomen, to allow easy access to the rectus sheath. The cord, sac and contents are treated as in the Bassini operation. After the sac has been tied off and returned

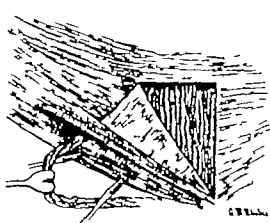


Fig. 2.

an upper transverse incision across the width of the muscle of the corresponding side, and a longitudinal incision near the midline of the abdomen, meeting the first incision above and prolonged down as far as the symphysis if necessary. The external oblique is now split in the direction of the fibers as shown in Fig. 1 A B, and the flap C is pulled through the slit thus formed. The flap is sutured to the posterior sheath edge of Poupart's ligament, taking the place of the conjoint tendon, and the cord transplanted. Operation concluded as in a typical Bassini operation.

It may be objected that the space denuded by the removal of the rectus flap may become the site of a muscle hernia, but in practice it is possible to approximate the borders of the triangle with mattress sutures, so as to obliterate it, and the lower edge of the slit in the external oblique can be pulled over to assist in covering it.

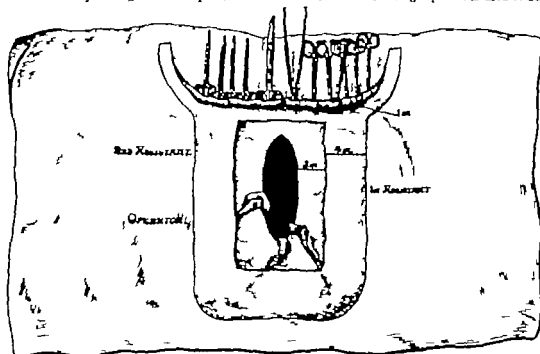
A LAPAROTOMY TOWEL

BY HENRY J. VANDEN BERG, M.D. GRAND RAPIDS, MICHIGAN

THE accompanying illustration represents a laparotomy towel especially useful with the patient in the Trendelenburg position. It is designed to be placed over the ordinary laparotomy sheet. It is made with two pockets, a narrow transverse one above and a deeper U shaped one around the sides and lower end, as represented in the cut. The narrow pocket is intended to hold a few instruments such as are used constantly throughout the operation viz

into his hands. On the assistant's side the position of the instruments is reversed for his convenience. We make it one of the duties of the second assistant to keep this pocket supplied from the tray and to keep it in order so that the operator and first assistant can always be sure of finding the instruments there and in place.

This arrangement brings the instruments just above the upper end of the incision and very close to the work. The larger pocket is used to hold



catch forceps, scissors, and probably one or two other instruments, with the idea of having them close at hand, yet eliminating the nuisance and even danger of having them slide down into the field of operation.

We have found that the depth of this pocket should be from one to one and a half inches, or just deep enough to keep the instruments from sliding, yet not so wide that it becomes necessary to draw them out of a pocket, so to speak. This would interfere somewhat with the handiness.

On the operator's side the forceps are placed with the grip downward, making it handy for him to grasp, or for the assistant to quickly place them

the forceps which are attached to the tape of the laparotomy sponges. As the nurse hands over a sponge she drops the forceps into the pocket, which prevents them from sliding down possibly into questionable grounds and at the same time places them out of the way.

You will see that this towel has its greatest usefulness when operating as above stated, in the Trendelenburg position, as it then serves a double purpose. However the deep pocket for the tape forceps alone is of sufficient value to merit its use in all laparotomy work. We have used it now for seven years with satisfaction and recommend its use to other operators.

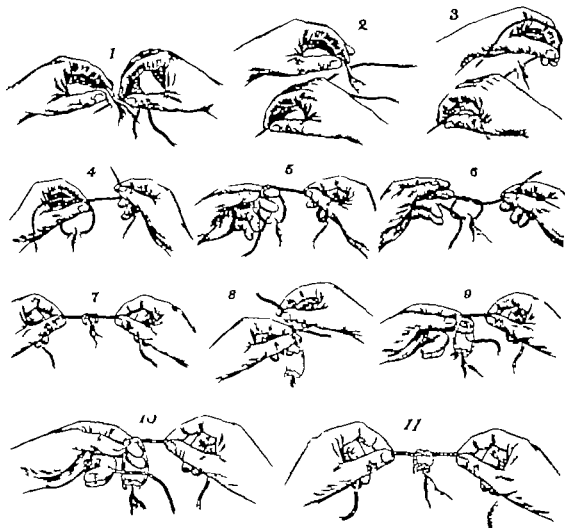
APPLYING SKIN SUTURES

BY WELLER VAN HOOK A. B., M. D. CHICAGO

THERE are but few surgeons who have not given more or less attention to the rapid and efficient suturing of wounds of the skin, since almost all operations leave an integumentary wound that demands closure. Modern long incisions make rapid and substantial suturing a necessity.

The writer has tried many methods but for simplicity and generally effective applicability recommends the following

Silk worm gut is the best material. If soaked for a few minutes in methyl blue solution it will be much more easily seen. Fishermen, for whom the material was devised, like it best when quite translucent, since the lure is on this account less visible to the fish. The surgeon needs the opposite quality that of opacity. The material should be thoroughly boiled with the instruments this makes it soft and pliable and does not seriously affect its strength.



The needle should be a straight Hagedorn not too large. The skin edges are lifted and slightly rolled outward. The needle is then introduced into the skin at such an angle that when the stitch is tied (a) the edges are approximated without being turned out or rolled in (b) the skin and the underlying fat-thickness are supported (c) there are no gaps left between stitches.

The question of rapid and effective manipulation is largely solved by the use of the materials chosen. The straight needle gives the operator constant, accurate knowledge of the whereabouts of the point and the power by the use of the needle as a carrier and lever to adjust the tissues that are being manipulated.

The Hagedorn needle with its knife-edge point and large eye passes easily through the tissues making a clean wound and is very easily freed

of its thread and easily armed again. With a little practice the surgeon can sew up a simple wound as fast as a quick nurse can supply threaded needles. The nurse should stand at the operator's left and, holding a bunch of well trimmed silk-worm strands in the right hand she can quickly thread them and either give them into the operator's hands or stick them in a towel near his right hand.

The Hagedorn needles should be sharpened on a small stone and polished with emery before each operation.

A rapid and certain set of manipulations in passing and tying the sutures is as necessary as are proper materials.

A series of such manipulations which the writer has long used are so illustrated in the accompanying drawings that the reader can easily understand and practice them.

CORRESPONDENCE

IN RE THE MALIGNANCY OF GIANT-CELLED SARCOMA

To the Editor In the July 1913 number of SURGERY GYNECOLOGY AND OBSTETRICS page 30, Dr J. Clark Stewart of Minneapolis contributes a paper entitled The Malignancy of Giant-celled Sarcoma.

I was especially attracted by the criticism contained in this article of a paper published in the *Annals of Surgery* February 1913 entitled Chronic (non-suppurative) Hemorrhagic Osteomyelitis."

- Synonyms (a) Medullary giant-cell sarcoma.
(b) Myelogenous giant-cell sarcoma.
(c) Myeloma.
(d) Medullary giant-cell tumor (Bloodgood)

As your correspondent is the author of the paper referred to, he feels that not to reply would appear like giving assent to Dr Stewart's conclusions.

Whether or not the diagnoses made in the cases reported in the *Annals of Surgery* were "justified" must rest upon the records published therein.

The clinical evidence obtained and noted of the first case reported is fairly typical of what has heretofore been described as slow growing medul-

lary giant-cell sarcoma occurring as a single lesion in the ends of the long bones.

The gross pathologic picture of this case was absolutely typical.

The writer does not know of any other gross lesion of bone where the naked eye appearance of the mass is so uniform and clear.

If one sums up the clinical, X-ray and gross pathologic pictures these lesions exhibit, the evidence is ample to give a positive and conclusive diagnosis.

The histo-pathologic picture adds cumulative evidence, but to the modern surgeon does not begin to have the value that the gross appearance of the lesion properly interpreted presents.

The microscopic examination was made in the first case as a matter of routine, not because it seemed necessary to confirm the diagnosis. It was confirmatory however of the diagnosis made.

In Case No. III the specimen sent for microscopic examination to the laboratory was mislabeled.

The statement that in one case the diagnosis was made from the skiagraphic picture alone is a mistake. The diagnosis was reached in this case in connection with the clinical picture obtained

and the X-ray findings. Since this case was reported, the patient submitted to operation and the diagnosis has been verified macroscopically and microscopically.

It is not so "unique" as the Doctor may imagine to make fairly accurate diagnoses from X-ray plates if he could realize that in one institution we have the opportunity of studying the plates of over fifteen hundred cases annually of bone and joint lesions alone.

Dr Stewart states that from the description given of these cases that they "tally exactly" with cases he described as non-suppurative osteomyelitis at the Western Surgical Society in December 1910.

I have looked up the article referred to and also find the same paper given more in detail in the *New York Medical Journal* March 25 1911.

After a careful reading of this paper I am quite unable to see wherein the cases reported by Dr Stewart "tally" with those reported by me.

It seems to your correspondent that a comparison of both papers clearly shows an altogether different line of reasoning, thought, conclusion, and different case reports.

The term "non-suppurative osteomyelitis" was first made use of by Oller and frequently since by different authors for various bone lesions.

I am not aware that the term "chronic (non-suppurative) hemorrhagic osteomyelitis" has been previously given to any bone lesion or the belief advanced that the so-called slow growing medullary giant-cell sarcoma occurring as a single lesion in the ends of the long bones is simply a hemorrhagic form of osteomyelitis, exhibiting extensive formation of exuberant embryonal vascular granulation tissue replacing destroyed cancellous structure.

Referring to the two cases reported by Dr Stewart under the title, "The Malignancy of Giant-celled Sarcoma, SURGERY GYNECOLOGY AND OBSTETRICS, July 1913 page 30 it seems to the writer from the description and evidence given that a more correct designation for the lesions would be mixed cell and spindle cell sarcoma, respectively.

Yours truly

GEORGE BARRIE.

New York City

ABDOMINAL, OR EXTRA UTERINE PREGNANCY WITH LIVING CHILD

B J SHELTON HORSLEY M D Richmond Virginia

In December 1913 I read an article entitled Abdominal Pregnancy with Living Child before the Southern Surgical and Gynecological Association, reporting a case and showing the mother and child. The article was published in the July number of *SURGERY GYNECOLOGY AND OBSTETRICS*, 1913. An attempt was made to bring the literature on this subject down to January 1913. The material for this part of the paper was obtained through some one in Washington, D C., who searches the literature in the Surgeon-General's Library. Since the paper was published I find that only the literature listed in the Index Medicus under abdominal pregnancy was reported to me. Consequently a great many cases which have appeared from 1897 to 1913 have been overlooked because they were listed under ectopic, or extra-uterine pregnancy and not under "abdominal pregnancy." The term abdominal pregnancy was used in the broad sense meaning a pregnancy that developed and came to full term, or nearly full

term, within the abdominal cavity and outside of the uterus. The following are references that were omitted.

First of all there are 14 cases reported by A. Sittner published by him in *Arch. f. Gynak.*, Berl. 1907-1908, lxxiv 1-95. Sittner's own case has been referred to as Case No 7 in my previous article.

CASE 1. Bonckhorst A., Karlsruhe, February 890, personal communication. Aet. 28 years, III-para. Last confinement 14 months ago. Mother recovered. Child, male, 3440 gm., 45 cm. still living.

CASE 2. Fischer A. Tiffa, March 3, 900, Rusk. Vrach., 903, No 3. Aet. 30 years, II-para. Mother died 48 hours later from acute ascites. Child, female, 2800 gm., 50 cm. well formed and was delivered alive.

CASE 3. Pasquah, E., Rome January 7 901. *Pothén*. 901. Aet. 3 years, primipara. Mother recovered. Child was poorly developed, lower extremities deformed, lived 24 hours.

CASE 4. Lentz, December 25, 190. Dissertation, Braunschweig. 901. Aet. 27 years, II-para. Mother recovered perfectly. Child lived 30 minutes.

CASE 5. Fischer A. Tiffa, October 4, 902, Rusk. Vrach. 903, No 3. Aet. 26 II-para. Mother recovered.

BOOK REVIEWS

A TEXT BOOK ON TUMORS. By Arthur E. Hertzler, M.D.
Ph. D. Philadelphia and New York: Lea & Febiger.

The book is well written, the descriptions, while brief, are clear. The subject matter is well arranged and the ease with which the book may be read, together with the numerous well chosen illustrations, should make this work an extremely interesting and practical treatise for students and practitioners alike.

The work is divided into three parts, the first being devoted to brief discussion of the general biology of tumors, etiology, classification, structure and metastasis.

In the second part the author discusses the general pathology of the various tumors, their macroscopic and microscopic appearances, diagnosis, prognosis and treatment.

The third and largest portion of the work is devoted to an excellent presentation of the more clinical aspects of tumors by special regions. This part of the work is profusely illustrated by original illustrations of cases from the author's practice and deserves the highest commendation for both the author and the publishers. F. R. ZART.

THE CAUSAL AND SUPPURATIVE DISEASES OF THE ACUTE OR SUBACUTE STAGES OF THE NOSE. By Ross Hall Sullivan, M.D. Philadelphia and London: J. B. Lippincott Company.

This work, the first on the subject in English, except that of Turner of London, deserves careful study by those interested in the accessory sinuses, on account of its scientific thoroughness and the painstaking care with which it has been prepared. It treats not only on or two phases of the subject but aims to cover the whole ground, beginning with the surgical anatomy and physiology of the nose and devoting much space to the pathology, diagnosis and treatment surgical and otherwise complications, etc. Especial stress is laid on the treatment of sinusitis in general and of the individual sinuses separately. Space permits mentioning only a few of the many admirable points of the work. Under the heading of the ethmoid labyrinth, new classification of pathological conditions is attempted and seems satisfactory. A valuable characteristic is the minute detail into which the author goes in his elaboration of the technique of the various operations, not only in the text but in the great number of excellent original illustrations. It is very valuable as bibliography as there are nearly six hundred references arranged in the form of foot-

notes. These show the careful study and reading that was necessary to produce this work, due credit thus being given for all literature consulted. It is a thoroughly practical book, more so perhaps than any of the German works on accessory sinuses and is a book for the specialist on account of its thoroughness and accuracy. At the same time it is so simply written that a beginner has little difficulty in following the descriptions, so well amplified with illustrations. The manuscript has been corrected and revised by Prof. Georg F. Martin and shows the result of his work, although the number of typographical errors usually found in first editions are present.

GEORGE M. COATES.

GONORRHEA IN WOMEN. By Charles C. Norris, M.D.
Philadelphia and London: W. B. Saunders Company.

Dr. Norris has written a very complete volume on a subject seldom handled in just this manner. It would seem that such a volume is needed, especially among the physicians of the more densely populated districts where the Neisserian infection is so prevalent. The book as a whole is comprehensive including some few chapters, especially those on sociology and prostitution, that would not occur on first thought to the average man of the profession as belonging to a text of this character.

It is hardly necessary to state that the opening chapter dealing with the history of gonorrhea is interesting, and insofar as the reviewer is able to corroborate them, the historical facts and dates are reliable.

The chapter on bacteriology and pathogenesis is an able laborer's manual. One cannot speak too highly of the excellent work Dr. Norris has done on this most important subdivision of the subject. Cultural methods, staining morphology, pathogenesis, virulence and bacteriological diagnosis are all expounded with the fineness and simplicity of master.

The sociological aspects of the disease, gonorrhea as a cause of abortion, sterility and the destruction of eyesight in the newborn, are discussed. Statistics are carefully compiled, demonstrating the serious effects of the disease upon the given individual, and more especially its destructive influence upon the general civic body.

Under the head of prophylaxis the methods of preventing dissemination of the disease are presented. We are told of the conditions in the United States Public Health and Marine Service. The wonderful value of prophylaxis here shown will

be a revelation to a large number of readers. A chapter is devoted to approved methods of examination and of the means of ascertaining with certainty the presence of the gonococcus. The necessity for ascertaining when cure has been effected is also dwelt upon.

One of the most important subdivisions of a book of this character should be the one devoted to pathological changes. A criticism might be made of this volume in that Dr Norris has dwelt too lightly and briefly with this subdivision of his subject. In tracing the pathological changes incident to this infection Dr Norris begins with the external genitalia and follows the process through the generative tract to the ovaries and tubes.

There is a chapter on operative method of treatment and in this chapter conservatism is the rule with a caution to exhaust all medical treatment before surgical intervention is undertaken. The chapters on diffuse gonorrheal peritonitis and on gonorrhea during pregnancy, parturition and the puerperium are of great importance.

The final chapter deals with the medical treatment of gonorrhea and is very complete. Comparative study of results obtained by various methods of treatment gives opportunity to present the profession that which has proven best. The relative value and the present status of the serum and vaccine treatments are also considered.

THE EYE EYE. By Roswell Park, M. D. Boston.
Richard G. Badger Gorham Press, 9

Members of the medical profession incline more and more to run aside from the straight path of technical investigation and scientific writing to wander for short periods in the Elysian fields of less exacting literature. It is by no means wonderful that a great force should here one finds that are spangled with such bright names as Osler and Paget Holmes and Weir Mitchell. For those the outpouring of soul has been necessary delight but it has also been an honor to the profession and an ornament to literature.

One of the latest to resort to this form of intellectual recreation is Roswell Park, the Buffalo surgeon. His new book, which takes its title from the first paper therein, shows the great breadth of the interests that concern him and the unusual variety of subjects to which his investigations have led.

That a doctor should be interested in thanatology is a necessity which has been recognized by many others than the author of *Religio Medici*, and phallic worship through the medium of serpents and monuments is too closely allied to folklore to evade for long the search of the medical historian. Indeed Moses and Bartels, Das Welt, Fraser's Golden Bough, and many other compendiums of strange literature and bygone superstitions are to be found in many professional libraries.

These subjects are really part of liberal education in medicine and as such come to all who have the leisure to indulge their generous inclinations.

It is only when we consider such other topics as introiturgical symbolism, the Knights of St. John, Giordano Bruno and the relation of the Grecian mysteries to Christianity that Dr Park's wide reading, catholic interests and literary industry really become manifest.

The author has collected in small compass, almost too small, vast amount of curious and valuable information. In his critical attitude toward the various superstitions of the past he maintains the only position possible to the scientist, while his acute sympathy for those who have fallen victim to the ruthless agents of fanaticism is equally in accord with the human and truly Christian feelings of the modern materialist. He has shed his provincial and restrictive orthodoxy.

Student life in the Middle Ages, the evolution of the surgeon and the discovery of the circulation are other topics of more than usual excellence.

The matter is interesting, is well digested, and pleasingly presented. The book should be a welcome relief to the brethren whose eyes are fatigued and whose minds have been temporarily anesthetized by too rigorous application to professional subjects.

C. B. RICE

THE PRINCIPLES AND PRACTICE OF OBSTETRICS. By Joseph B. DeLee, A. M., M. D. Philadelphia and London: W. B. Saunders Company 1912.

I have prepared the first American textbook on obstetrics, written by Samuel Bond of the College of Physicians and Surgeons in the University of the State of New York. This was entitled *A Compendium of the Theory and Practice of Midwifery* containing practical instruction for the management of women during pregnancy, labor and in childbirth, illustrated by many cases and particularly adapted to the use of students. Professor Bond was a conservative teacher of experience and largely confined himself as he says in his introduction, to teaching the great resources of nature and delivering such rules and precepts as would in the first place prevent all unnecessary interference with her efforts.

Since the publication of this work our students and practitioners have not wanted good textbooks on obstetrics. We recall those of DeWeese, Hodge, Meigs, Lusk, Parvins, not to mention the more recent well-known works of Wm. Williams, Edgar Davis and others, as well as the several excellent systems written by the co-operation of the numerous teachers of the country. Many of these books have been characterized by the well marked individuality of the authors. The earlier books drew most of their scientific facts and many of the rules of practice from English and French sources. Those of the last thirty-five years have drawn more from Germany which has in this period been the Mecca of our students.

The work before us is worthy to stand with the best American textbooks. The author has also had German training and is imbued with the best

German ideals and methods. He is, however, also well acquainted with the English, French, Italian, and Russian literature and practice and gives us a book up to date in its presentation of the science of obstetrics.

The characteristic of the book, however, is its practicability. With great attention to detail he presents the management of pregnancy, labor and child-bed so that there can be no misunderstanding. In this he profits by his long years of service in building up the Chicago Lying In Hospital and Dispensary and by the experience gained there in training internes, students and nurses. Like our first American obstetrician, Bond, he starts out with a decided conservative trend which he preserves throughout. The responsibility of the obstetrician is kept constantly in view and the dignity of the specialty is consistently and persistently upheld.

The practical character of the book is shown in the first three sections, which consider the physiology of pregnancy, labor and the puerperium, in which the practical bearing of the physiological processes and changes is constantly noted. We especially commend the concise description, nomenclature and the clear presentation of the important subject of mechanism of labor. As an illustration of the completeness of the work we note that the author calls attention to the importance of determining the degree of engagement of the presenting part, a subject generally overlooked in textbooks.

The section on the hygiene and conduct of pregnancy and labor can be commended with little or no reserve. The clear descriptions, the exact directions and the beautiful illustrations make this section very attractive to the reader. Only one or two minor criticisms of details might be made. While the author does not subscribe to the theory of maternal impressions, he seems to regard it with some indulgence when he makes the fanciful suggestion that certain monstrosities may be caused by the action on the egg of toxins produced in the mother by emotions.

Whether there is sufficient superiority of alcoholine to the official preparation of petrolatum to justify its specification as an application to the nipple and areolae is an extensive advertising question. The ingenious recommendation of proprietary preparations has brought much discredit on the medical profession. The work of the official board of the American Medical Association has made it possible to get reliable information concerning these preparations and any article not approved by this council should be recommended with some hesitation. This remark would apply equally well to *lysol*.

We would suggest the name aspirating catheter, instead of tracheal catheter for the instrument used in extracting mucus from the child's throat. Rarely or never is it necessary to pass the catheter through the larynx and the name should not give mistaken idea of its use.

In one instance the word infected is probably

inadvertently used for contaminated in the statement that during pregnancy the vulva is always infected with nonpathogenic and pathogenic bacteria.

In the rules for the conduct of the third stage of labor it is directed to draw the cord up over the thigh leaving a loop hanging just so it touches the bottom of the basin which is pushed up against the perineum. Why should not the cord be cut off at the vulva permitting the placental end to slip back into the vagina and allowing the application of sterile vulvar pad?

The reasons given for prohibiting tub bath to the child until the umbilicus is healed will hardly seem satisfactory to all. With this exception the section on the physiology and care of the child is a model for clearness and practicability.

Hyperemesis gravidarum is classed among the toxemias and as such is considered as a distinct disease entity. The author does not agree with Williams that the toxic form can be diagnosed by the ammonia coefficient. The rules of treatment are conservative and give evidence of much experience. The difficult subject of induction of abortion is handled as well as the present state of diagnosis and prognosis allow.

In discussing Williams' rule to empty the uterus when vomiting is toxic the author says that positive diagnosis of toxemia cannot always be made and too many cases of toxic vomiting recur under the usual treatment.

In the treatment of eclampsia the rapid emptying of the uterus in deep narcosis after the first convulsion is preferred. The danger of narcotics and especially chloroform and morphine is emphasized. Elimination is said to be disappointing and hot baths and packs are disapproved. Venesection is spoken of favorably while decapsulation of the kidney is condemned.

The important subject of differential diagnosis of extra-uterine pregnancy is discussed fully and the treatment shortly summarized by commending operation.

The chapter on displacement of the uterus complicating pregnancy is unusually complete. Abortion in progress, associated with hemorrhage, is treated by tampon, generally followed by careful curettement. In septic abortion not complicated with hemorrhage it is generally best to adopt an expectant course and avoid the curettement.

In *obstructed placenta* or premature separation of the normally seated placenta the treatment recommended is rupture of the membranes, insertion of malleable catheter and the application of abdominal compression bandage in case the cervix is not sufficiently dilated to admit of extraction with forceps or craniotomy. If conditions permit, abdominal or vaginal Caesarean section may be done.

The author's positive stand in favor of terminating pregnancy in placenta previa is very desirable considering the reckless indifference of many physicians when consulted for hemorrhage during

pregnancy. He insists that all cases should be sent to a hospital. He carefully indicates what cases may be treated by rupture of the membranes, by version, and by metruorrhagia. The technique of these operations is given in detail. The propriety of Cesarean section for selected cases is admitted.

Multiple pregnancy is classed among the pathological conditions because of the disturbance of pregnancy, the great number of pathological labors, the great danger of infection and hemorrhage and the bad prognosis for the children. The chapter on the acute and chronic diseases and the neoplasms complicating pregnancy as well as those on the diseases of the ovum and membranes, are concisely handled with satisfactory fullness and clearness.

In the most commendable section on the pathology of labor attention may be called to a few points where some difference of opinion might arise. In the enumeration of the causes of O. P. position, the failure of flexion and the lack of an efficient resisting pelvic floor are not emphasized as much as some might desire. Likewise the dislateral of the method of manual rotation because inefficient would not receive assent. The technique of delivering the impacted breech is not given in sufficient detail.

In general the entire subject of dystocia is treated most fully and clearly. Especial attention is called to the chapter on injuries to the parturient canal.

The subject of puerperal infection receives adequate consideration. The conservative management is advised, local treatment being practically dispensed with.

The last tenth of the book is given to obstetrical operations. The general considerations are most praiseworthy. The preparatory operations are especially well described and illustrated. The indications for low forceps are somewhat more lenient than some would wish. The author is in sympathy with the modern tendency to enlarge the field for Cesarean section. The extra peritoneal section is described but not recommended.

The book is one that can be recommended to students as full presentation of the science of obstetrics and a safe guide in the practice of the art. It is especially valuable to the physician who has not kept up to date in the recent progress in this field. It is worthy of the name as representing American scholarship and professional progress.

CHARLES S. BACON.

BOOKS RECEIVED

Books received are acknowledged in this department, and each acknowledgment must be regarded as sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

LEHRBUCH DER PRAKTISSCHEN CHIRURGIE FÜR ARZTE UND STUDIRENDE. Vols. I and II. By Dr. L. Gelpke and C. Schaller. Price, 90 marks. Leipzig, Germany. Johann Ambrosius Barth.

MANUAL OF OBSTETRICS. By John Osborne Polak, M. Sc., M. D. Price \$3.00 net. New York and London. D. Appleton & Company.

THE PRACTICAL MEDICINE SERIES. Vol. IV. Gynecology. Edited by Emilion C. Dudley, A. M., M. D. and Herbert M. Stowe, M. D. Price \$3.35. Chicago. The Year Book Publishers.

TRATÉ DE RADIOLOGIE PRACTIQUE. By André Lignon and Camille Hahn. Price 9 francs. Paris, France. Société d'Éditions Scientifiques et Médicales.

MANUAL OF SURGERY. Third edition. By Francis T. Stewart, M. D. Price \$4.00 net. Philadelphia. F. Blakiston, Son & Company.

30-7 GEBURTSUNGEN UND BEACHTUNGEN. By Prof. Dr. Heinrich Fritsch. Bonn, Germany. A. Marcus & E. Walter.

MARRIAGE AND DIVORCE. By Charles A. L. Reed, M. D. Price \$1.00. Cincinnati. The Galton Press.

SYMPTOMS OF THE NERVOUS SYSTEM. By Max Noakes, M. D. Translated from the second edition by Charles R. Hall, B. A., M. D. Price \$4.00. Philadelphia. J. B. Lippincott Company.

THE SCIENCE OF THE STOMACH. A Handbook of Diagnosis and Treatment. By Herbert J. Peterson, M. A., M. B., F. R. C. S. Price \$3.50. New York. William Wood & Company.

AN INTRODUCTION TO THE STUDY OF INFECTION AND IMMUNITY. Including Serum Therapy, Vaccine Therapy, Chemotherapy and Serum Diagnosis. By Charles E. Simon, M. D. Second edition, thoroughly revised. Price \$5.50 net. Philadelphia and New York. Lea & Febiger. 913.

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